ELECTRICAL REVIEW

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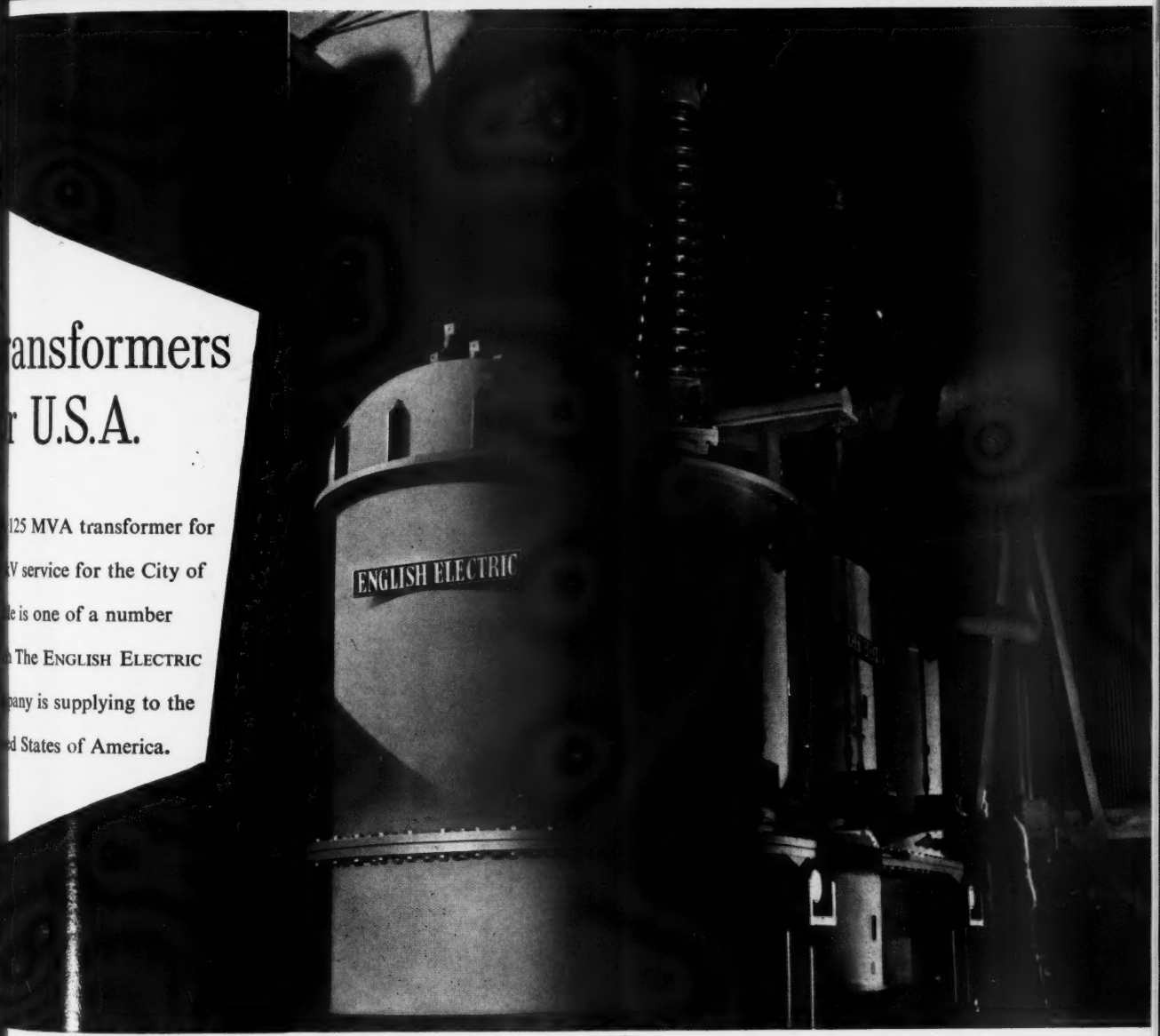

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22 JULY 1955

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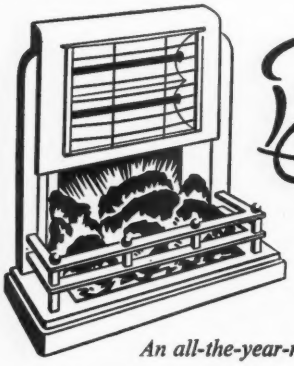

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ELECTRICAL REVIEW

22 July 1955 Vol. 157 No. 4 Established 1872

Coal and Electricity

THERE has been much talk of late about coal as a wasting asset in this country. Technically of course coal is and always has been a wasting asset. But to use the term in the sense that the coal industry is one without a future is damaging particularly to the coal and electrical industries. Perhaps it is natural that a gloomy picture should be painted in view of the history of the industry, particularly the dissatisfaction of the miners over several past decades; the decreasing production of coal during several past years; and now the latest and biggest increase in the price of coal.

At the recent British Electrical Power Convention Lord Citrine, chairman of the Central Electricity Authority, made a plea that the talk about the "wasting asset" should be stopped. Such a plea could not have come from a better quarter, for the coal and electricity supply industries are closely linked. The future of the electricity supply industry depends on the future of the coal industry and it is all-important that electrical men should continue to believe in coal, as there is every reason for them to do. Why? Because there is enough coal to go round for, say, another century according to the most conservative estimates of the authorities; and because mine electrification can continue to do very much indeed to increase the output of coal and to make working in the coal mines much less unattractive.

After seeing at close quarters over many years the work of electrification going on hand in hand with advances in materials handling we are convinced that by these means the future of the industry is assured, and it is most encouraging to note that Mr. B. L. Metcalf, chief engineer of the National Coal Board, shares our enthusiasm as is shown in his article "Electricity in Coal Mining" in the 25th March issue of the *Electrical Review* and in the paper he presented at the British Electrical Power Convention last month. And some of Mr. Metcalf's colleagues showed equal enthusiasm in the four following issues of the *Electrical Review*. Furthermore, during the past decade immense schemes have been undertaken by the N.C.B. to improve production—new sinkings to reach better seams and widespread modernization of existing workings—all with near 100 per cent electrification, and by far the majority of these schemes have not yet been brought to fruition.

Is this the time then to decry that upon which our industry mainly depends and must continue to depend for a very long time? Let us instead give all the help we can, and every responsible electrical man appreciates how very much that help can contribute to the success of the electrical industry as a whole.

GENERATING PLANT MANUFACTURE

The demand for electrical power continues to grow in all parts of the world and in an effort to increase the efficiency of generation and keep down the cost of electricity there is a trend towards the use of turbo-alternator sets of higher individual capacity. At present the largest sets in commission in this country are of the order of 100 MW, but construction is in progress of sets rated at 120 MW and designs are at an advanced stage for 200 MW and even larger generating units. To ensure that it will be in a position to meet in full the requirements of the electricity supply industry in the future, the Fraser & Chalmers Engineering Works of the General Electric Co., Ltd., has just opened a new heavy turbine shop at Erith. It is designed to facilitate the manufacture and testing of the largest sets at present envisaged for power generation and adequate boiler plant is available to provide steam for testing, together with the necessary water supplies. This new works does in fact provide facilities on the scale necessary for building machines with ratings up to as high as 400 MW.

INSTRUMENTS AND EFFICIENCY

The old problem of obtaining full advantage from instruments designed to improve efficiency was a prominent feature of the discussions at the recent joint conference of the Combustion Engineering Association and the British Industrial Measuring and Control Apparatus Manufacturers' Association. Difficulties in doing so can for the most part be got over only at management level. First comes the need to train operatives to appreciate the true value of instruments, instead of tending to regard them as so many ornamental gadgets. Then there is the correct interpretation of what the records, when co-ordinated, reveal of the working of the process as a whole; this work calls for qualifications that are not available in many of the smaller installations, so that the records simply get filed. A third aspect is ability to choose instruments that will best stand up to hard usage in view of the shortage of maintenance mechanics. Where these facilities cannot be provided the simplest form of automatic control appears to provide the best solution.

WORKS EDUCATION AND RECRUITMENT

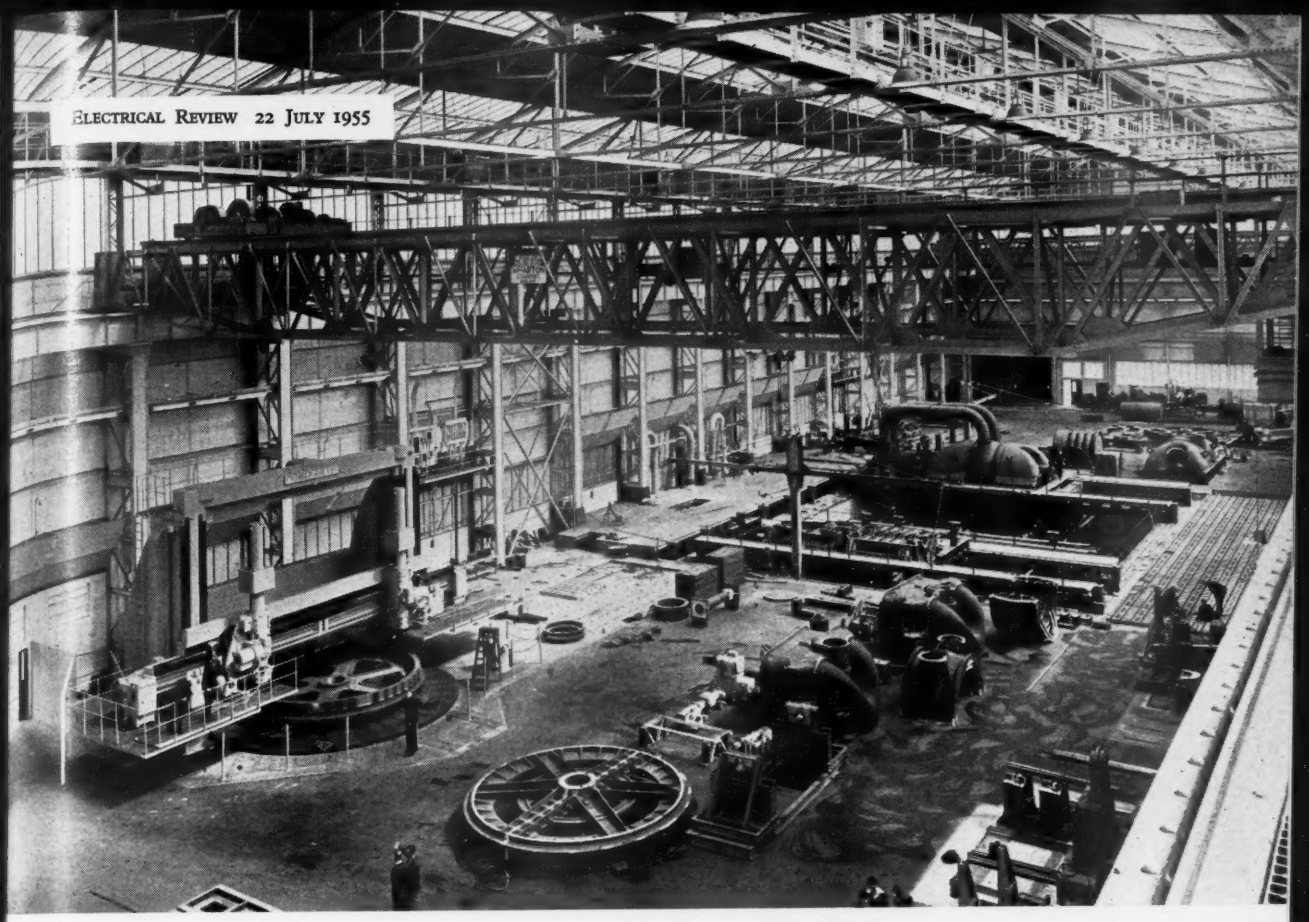
Many of the works education and training schemes in being to-day are of mushroom growth and have come into existence merely as the result of the somewhat hurried efforts of individual concerns to solve their particular problems in view of the shortage of technologists during the last few years. Such schemes, however, should be entirely divorced from those well-established ones which were inaugurated long before the present national emergency and as the result of far-sightedness on the part of the companies concerned who foresaw the necessity of ensuring adequate first-class human raw material for their future success. One result of the present rather alarming position in the shortage of technical men is that when one thinks of any particular works training scheme the tendency is to link it up with emergency schemes of recruitment. Thus when we were reminded last week that the works educational scheme of the Metropolitan-Vickers Electrical Co., Ltd. (referred to elsewhere in this issue) had been in existence for 40 years it was something of a surprise. While no doubt increased attention is focused on the scheme by the company to-day because of present conditions, the fact remains that the scheme does exist and has existed all these years primarily to see that the company has an assurance of the best material available for the future, but also as a contribution to meeting the national needs generally. It is inevitable in any case that the small concern should benefit from the efforts of a larger firm more able to establish such a scheme; but the greater contribution lies in the co-operation of Metropolitan-Vickers with the Manchester colleges in establishing and maintaining sandwich courses and the like, and in this particular connection the electrical industry as a whole is much indebted to the company.

GREEK PROJECTS

In his article "Prospects in Greece" published in our issue of 13th May Mr. M. A. Veronikis, of the Electricity Division of the Greek Ministry of Industry, mentioned the projected erection of an 80 MW lignite-fired power station at Ptolemais. It is now announced in Athens that contracts have been placed for the work. Part of the cost of £7·1 million will be met by Krupps and presumably the plant will be German although the station will be erected by Greek contractors. It is also announced, somewhat belatedly, that the contract for the erection of an 84 MW hydro-electric station on the River Megdova has been awarded to the French concern Omnium Lyonnais, a fact which Mr. Veronikis also mentioned in his article. The Greek Prime Minister (Field Marshal Papagos) said that while the German and French credits were valuable in the economic development of Greece the country still needed American aid.

WORKING TOGETHER

The development of specialist items for use in connection with major plant such as the boilers and turbines of a modern generating station is often handicapped by the lack of full-scale facilities on which to test them out in the experimental and prototype stage. Given co-operation, this difficulty can be overcome as is well shown by the boiler initiator described on page 174 of this issue. The development of this oil burner involved the installation of eight different prototypes before complete satisfaction was obtained and since the fitting of such apparatus means substantial modification to the boiler walls, and the tying up of the boiler for considerable periods of time, it is no mean gesture to make available a 200,000 lb/hr boiler. The Southern Division of the Central Electricity Authority is to be congratulated on its patronage of such development, and with it the two station superintendents who, as a class, can probably take much credit for the readiness with which they welcome new ideas for trial in their stations, often involving many hours outside those of routine. It is this continued interest, in its purest sense, which does so much to stimulate engineering progress, and, incidentally, to keep those who practise it young in heart.



Steam Turbine Production

FRASER & CHALMERS OPEN NEW HEAVY PLANT SHOP

A NEW heavy turbine shop for the erection and testing of the largest machines at present envisaged for power generation was opened on Friday last at the Fraser & Chalmers Engineering Works of the General Electric Co., Ltd., at Erith, Kent. The opening ceremony was performed by Lord Citrine, chairman of the Central Electricity Authority.

The new shop increases substantially the manufacturing capacity of the company, and provides facilities for building machines up to ratings as high as 400 MW. It is a steel fabricated building, brick-filled up to 13ft from the ground. Above this level the walls and roof are clad with metal sheeting and lined with plasterboard. The shop consists of a main bay 364ft long and 131ft wide, with a machine tool annexe 284ft by 40ft on one side. In the main bay the height to the eaves is 59ft, and in the annexe 37ft. The height to the apex of the roof in the main bay is 82ft.

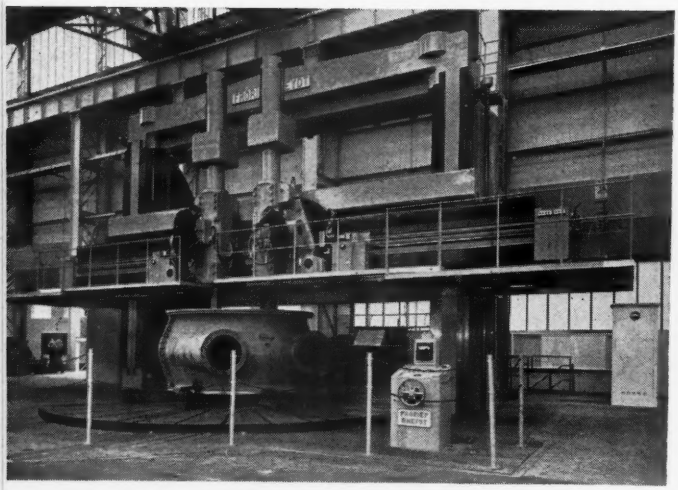
Two 60-ton Wharton cranes with a span of 120ft run the full length of the shop at a height of 43ft. Both can be operated in tandem for a lift of 120 tons. In addition to the 60-ton main hoist, each crane has a 20-ton auxiliary hoist and is powered by four 500 V d.c. motors operating the two hoists, and the longitudinal and cross traverse.

Turbine Test Pit

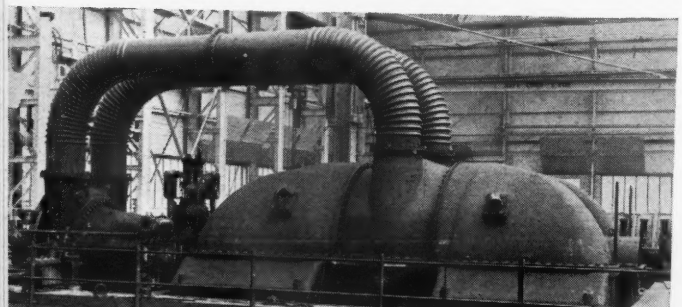
The pit on which turbines are erected and tested is 87ft long by 87ft wide. The depth is 13ft 11in, and it adjoins a 17ft deep pit for the condenser. Three machines of any of the capacities now current or planned can be erected simultaneously, the bed of the pit being designed to allow the utmost latitude in this respect both as regards the size of the turbines and the positions of the supporting points. For this purpose the whole of the base of the bed is equipped with plates slotted with tee-slots to receive the cast iron stools, 30in square, on which the supporting columns stand.

The columns, 26in square at the top, are all a uniform 8ft 4in high and they support the girders spanning the pit through register blocks designed for packing of variable depth to provide fine adjustment of level. The girders on which the machines are bolted are in three sections, two of them 17ft long and the third, at the frame end, 11ft long. All sections are 3ft 4in deep and 18in wide. At each end of the pit three 10 cwt electric hoists are mounted on 20ft radius swing arms along which they can be traversed manually; the arms are pivoted from a common vertical girder. Six 50 cwt cranes on 18ft radius jibs are also provided.

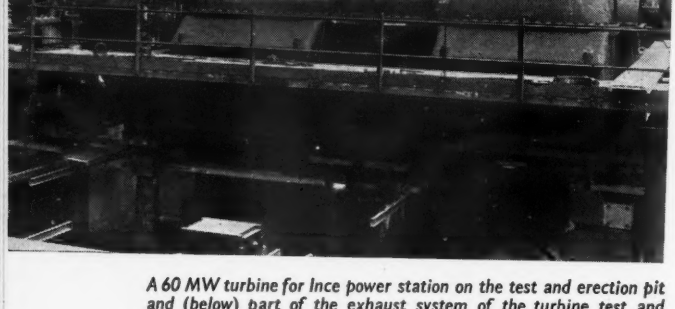
Steam from the adjacent boiler house is supplied at 665 lb/sq in and 875 deg F through 6in bore piping. From each turbine exhaust 4ft diameter pipes run into a 4ft 6in diameter main trunking of ribbed construction, which communicates with the condenser. The condenser was supplied by Worthington-Simpson, Ltd., to deal with 45,000 lb/hr of exhaust steam from machines under test at 28in Hg vacuum. With a surface area of 4,000 sq ft, it is complete with its own extractor and c.w. pumps.



Machining a turbine exhaust casing on the 26ft vertical boring and turning mill



A 60 MW turbine for Ince power station on the test and erection pit and (below) part of the exhaust system of the turbine test and erection pit showing the 4ft pipes communicating with the 4ft 6in main to the condenser



Lubricating oil for the turbines is circulated by motor driven pumps through oil coolers, storage tanks and oil cleaning and centrifugal plant. All supply arrangements are designed to enable from one to three machines to be run simultaneously or individually at any position on the pit. Turbines are tested after assembly at overspeed conditions.

Steam is supplied by an International Combustion boiler of special design. It is a twin-furnace, oil-fired boiler which is differentially fired to provide steam at any predetermined temperature up to 875 deg F. The capacity is 45,000 lb/hr at 665 lb/sq in and it is complete with its own forced and induced draught fans, and feed heating, including a de-aerator supplied by the Neckar Water Softening Co., Ltd. Provision has been made for an independently fired boost superheater to be fitted later to raise the steam temperature to 1,060 deg F.

To mark the opening of the shop, Lord Citrine started up an 11,215 h.p. turbine which was on the bed for adjustment of governing valve and auxiliaries preparatory to being coupled to a 90,000 cu ft/min blower for a closed circuit air volume test. This turbo-blower is the first of two units being supplied for the power station of the new works of Colvilles, Ltd., at Ravenscraig, Motherwell. In addition to the two turbo-blowers, the G.E.C. is supplying three 10 MW turbo-alternators and two turbo-driven water-circulating pumps for the first stage of the power station scheme. The company's contract for this project includes buildings, cooling towers, boilers, transformers, switchgear, lighting and all accessories. When installed, the Colvilles blower turbines will operate at 400 lb/sq in 800 deg F, giving an air output from the blower of 90,000 cu ft/min at 32 lb/sq in. The speed will be 2,310/2,700 r.p.m.

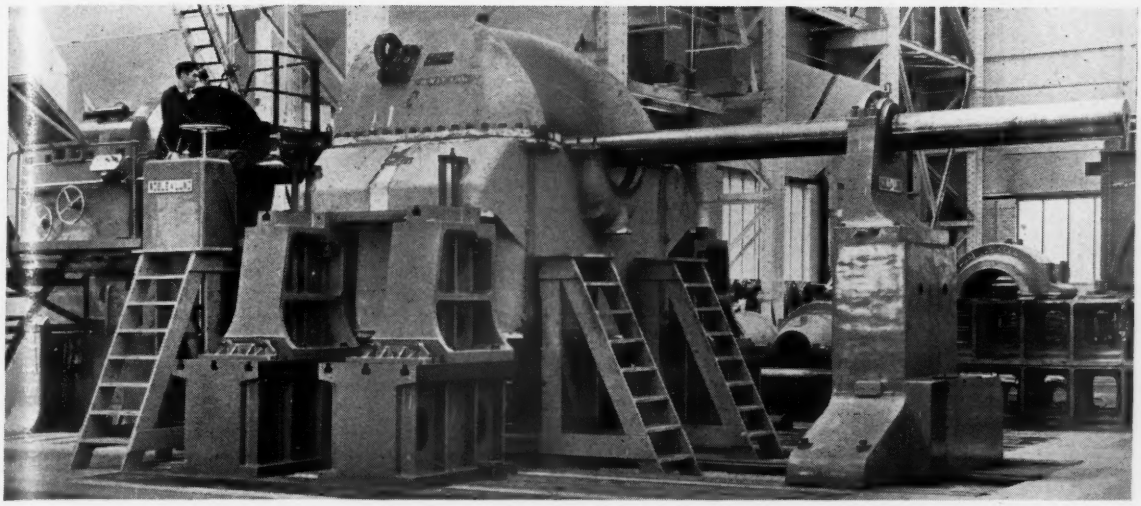
Two turbines for G.E.C. turbo-alternator plant in course of supply to C.E.A. power stations are also on the bed. One of these is the sixth 60 MW machine for Uskmouth. These turbines operate with steam at 900 lb/sq in and 900 deg F and a vacuum of 28·9in Hg. The third turbine on the bed is the fourth of five 30 MW turbo-alternators for Huncoat generating station. The steam conditions in this case are 600 lb/sq in and 850 deg F, and vacuum 28·6 Hg.

A three-phase supply is brought into the switch-room of the new shop from the 2,850 V works ring main. Two 250 kVA external transformers step down to 415 V. This is brought into a six-panel board for distribution throughout the shop. A d.c. supply is obtained from the works rectifiers. A 127 kVA power factor correction capacitor assembly is housed in the switchgear room.

Lighting in the main shop comes from a combination of mercury and fluorescent sources. Three rows of 1 kW mercury lamps in high bay fittings are supported on brackets from the roof trusses at 20ft centres longitudinally and with 37ft between the rows. The height above floor level is 58ft. Walkways give access to all fittings, and the gear cases are attached to the handrails.

A row of angle type twin tube fluorescent fittings with louvres runs round all four walls of the main shop 30ft above the floor. The average service illumination is 20 lumens/sq ft. In the machine tool annexe the fittings are of the combined mercury and tungsten type, each housing one 400 W mercury and one 750 W tungsten lamp.

Heating is by a hot water system with Electroflo electronic control of water temperature, using water heated by steam at 200 lb/sq in from the main boiler plant. The water is pump-circulated through 19 downstream dual-flow heaters with fans for circulation of air. In addition radiant heating panels are mounted at 15ft level round the shop. Further unit heaters mounted in



Noble and Lund machine boring bearing ways in a turbine low-pressure casing

pairs above the doors are arranged to be switched on automatically when the doors are opened in cold weather.

The shop is liberally provided with natural lighting, both by windows and continuous glazing in the roof. All high-level windows can be motor-operated from remote control push-button stations at floor level. Local control push-buttons are fitted at window level.

The shop is fully equipped to undertake the planing, boring and drilling of large castings and machining of smaller parts. Rotor discs are machined in the shop, but the blades are fitted and the rotors assembled complete, and balanced, in one of the other turbine shops, whence they are delivered to the new shop for building into the machines.

Most of the machine tools are housed in the annexe, but several of the larger units are accommodated in the main shop. A Froriep 26ft vertical boring and turning mill installed for work on the largest parts, such as turbine exhaust casings, is one of the largest of its kind in the country. The table, made in three sections, has a diameter of 25ft 9in and will take a total load of 200 tons. The maximum height under the tool is 13ft 11½in.

The main motor is a 173 h.p. 500 V d.c. machine and the speed range of the mill is from 0·2 to 6·7 r.p.m. Auxiliary motors comprise two of 7¾ h.p. for rapid traverse of the slides and two of the same rating for rapid traverse of the rams; one 33½ h.p. motor for raising and lowering the cross rail; a 12½ h.p. motor for mechanical clamping of the rail; and a 1 h.p. oil pump motor. All auxiliary motors are 415 V a.c.

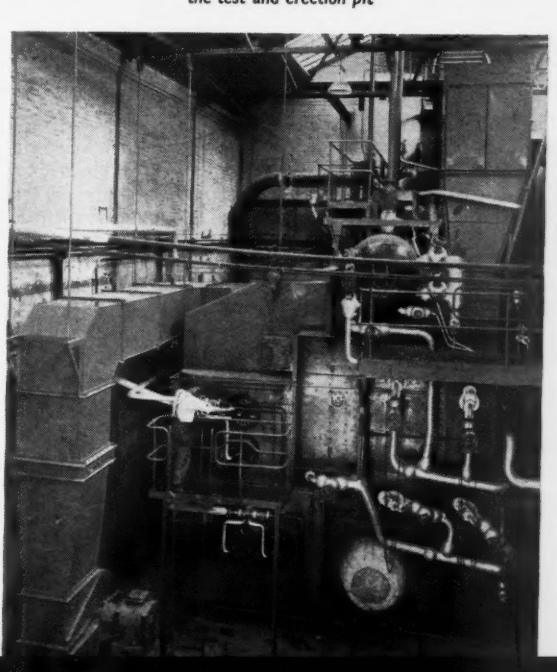
A Craven 12ft vertical boring and turning mill with 5ft 6in ram traverse will be installed in the main shop for machining high-pressure steam casings, and arranged to admit 10ft 6in under the tool holder. A 6ft vertical boring and turning mill of Craven manufacture is also provided, and a similar machine in the annexe will be used for taper turning when machining rotor discs before the blades are fitted.

An Asquith 12ft 6in radial drilling machine in the main shop is employed on drilling bolt holes in all casings and has been adapted to take work of over 10ft 6in under the spindle.

For boring turbine cylinders there is a Noble & Lund machine taking a 12in boring bar. Height from the centre line to the 23ft 9in by 10ft work bedplate is 9ft, and the distance between steadies 20ft. Sixteen spindle speeds are provided by a drive from a 3 h.p. variable-speed motor through a change-speed gearbox. The main driving motor is of 20 h.p., and auxiliary 7½ h.p. motors are provided for rapid power traverse of the headstock and boring steadies, and rapid adjustment of the outer steady.

The shop is to be equipped later this year with a 45ft stroke Craven planer for planing turbine casings, with measurements of 15ft between uprights and 10ft 6in under the tool. The main driving motor will be a 120 h.p. variable speed machine supplied from a Ward-Leonard set, having a speed range of 350/700 r.p.m. Cutting and return speeds will be 20 to 120 ft/min in high gear, and 12½ to 75 ft/min in low gear. Both saddles of the machine are adapted for cross planing and driven by a separate 25 h.p. reversing motor. A 15 h.p. motor drives the patented electric feed gear, and the same motor is used for quick traverse of the tool boxes. Also in the main shop is a Kitchen & Wade horizontal boring and tapping machine with 36 speeds and 18 rates of feed. Machine tools accommodated in the annexe comprise internal and external grinding machines, lathes, horizontal and vertical boring, facing and turning machines, and a slotting machine.

Twin-furnace International Combustion boiler supplying steam for the test and erection pit



Engineering in Europe

Abstracts from Foreign Technical Journals

IT is now well established that block-type concrete foundations are suitable only for l.v. line supports or where the ground is exceptionally bad (peat, muddy sand, etc.). The frame type foundation has, by comparison, the advantage of enclosing a core of natural soil and therefore of saving concrete. However, both types will be used only exceptionally for voltages higher than 150 kV. Individual, or stub, foundations can be shown theoretically to offer a satisfactory resistance to shear forces of the soil and this was confirmed by numerous tests in various soil types.

In most cases it will be required, and possible, to give these concrete stubs a wide base so that they represent a safe and economic solution of the foundation problem. Where even higher strength is required, for example in the transalpine h.v. lines for up to 380 kV, the stubs are either linked by concrete cross links nearer their top ends or put on a substantial frame-type base (particularly in clayey, sandy or gravelly soils). It is also well known that, in rocky ground, rock anchors must be used, the length of which depends on the type of rock and the position of the stratifications, if any.

According to the conditions prevailing, rock anchors can be dispensed with if it seems preferable to use concrete stubs of greater length instead. The two theoretical methods now used of calculating the strength of foundations are the shear strength method and the method of the soil wedge and one of them is a convenient means of checking the results of the other. For considerable forces like those exerted by modern h.v. line conductors the shear strength method is more reliable.—" Present State of the Art in Overhead Line Support Foundations," J. Killer, *A.S.E. Bull.*, Vol. 46, No. 9, pp. 424, 437-441, 30th April, 1955, in German.

Relay Protection

The author, who was closely connected with the introduction of modern methods of system protection and automatic control in Soviet power systems, surveys the most important problems in the light of experience gathered in the operation of systems so equipped. According to this experience, automatic control should not be overdone lest the complicated apparatus defeats its own object. This applies particularly to equipment assuring the stability of the parallel operation of power stations which needs no more than automatic regulation of excitation, rapid-reclosing after short-circuits and frequency-controlled load shedding. These devices in general render equipment for sectionalizing the systems superfluous, apart from very special cases.

Where system protection is concerned, rapid clearance of short-circuits is more important than selectivity, since slow clearance may cause widespread outages and even damage to equipment. The guiding principle here, too, should be to exhaust all the possibilities of the simplest protective devices before introducing more elaborate, complicated and delicate apparatus. The special types of generator, transformer and line protection predominantly used in Soviet systems are then discussed. The automatic regulation of generator excitation is preferably obtained by compounding with electromagnetic corrector, with additional relay-controlled forced excitation.

Frequency-controlled load-shedding is increasingly used (from 1945 to 1953 the number of installations rose by 780 per cent), as well as automatic switching-in of reserve supply. The author discusses the various methods of automatic rapid-reclosing in considerable detail, as well as its repercussions on system stability. Further sections deal with improved reliability of the operation of consuming devices in relation to the continuity of supply of the whole system, starting circuits of synchronous motors and compensators, and problems still to be solved.—" Fundamental Problems of Relay Protection and Automatic Control," I. A. Syromyatnikov, *Elektrichestvo*, No. 11, pp. 3-10, 1954, in Russian.

H.V. Slot Insulation

Good slot insulation is one of the primary considerations in the design of h.v. machinery and, despite the rapid development of ever more specialized synthetic insulating materials, the main constituent of the composite slot insulation has still to be mica, on account of its outstanding dielectric and thermal characteristics. However, the necessary mechanical strength must be provided by a support which may be either paper or glass cloth and the solid insulation is then impregnated with a suitable heat-resistant varnish; recently silicon varnishes have been increasingly used for this purpose. The greatest care has to be taken in the production of the winding that no air remains occluded in the insulation, or between conductor and insulation, and the latter is best prevented by coating the conductor surface with a conducting varnish before the insulation is applied. This method prevents ionization and corona phenomena which endanger the life of the insulation.

It is difficult to test the actual condition of slot insulation, since resistance measurements do not reveal any slowly proceeding deteriorating processes. Dielectric loss measurements carried out periodically enable at least indirect inferences to be drawn on the rate of ageing of an insulation of this kind. It should be noted that the specific structure of slot insulation makes it certain that any possible breakdown could only be of the thermal type. For this reason the type and quality of the impregnating varnish used is of the greatest importance and silicon varnishes are definitely the preferred choice, although they are expensive. Further measuring methods suggested are displacement current measurements, oscillographic measurements of the critical corona voltage of the winding and d.c. discharge tests of the winding capacitance. All these methods would have to be used together to obtain a fairly reliable indication of the condition of the winding insulation.—" Quality Criteria of the H.V. Insulation of Electrical Machines," W. Siemer, *E.T.Z.(A)*, Vol. 76, No. 9, pp. 321-325, 1st May, 1955, in German.

Readers who require accurate full translations of any of the articles abstracted in this section can be put into touch with the translators who will supply them at current rates.—Editors, *Electrical Review*.

POWER STATION EFFICIENCY

Constant Striving for Improvement

By C. J. CRAWSHAW, B.Sc., M.Inst.F.*

THE purpose of this article is to examine some of the factors contributing to the improvement of power station thermal efficiency. By this is meant the ratio of the heat output divided by the heat input. In other words the thermal efficiency equals 1 kWh (3,412 B.Th.U.) divided by the weight of coal in lb per kWh × its calorific value. Because the coal consumed is weighed and its heat value obtained, and the electrical units generated are measured, the simplicity of the formula is apparent. There must, however, be deducted from the generated units the electrical units used for the station auxiliary plant; by so doing the thermal efficiency on the units sent out (the figure that matters most) is obtained.

Every improvement in thermal efficiency leads to a saving in fuel, and new plant being commissioned, with stable fuel prices, reduces generating costs. As the present tendency is for fuel prices to keep on rising, such financial savings are lost, although the price per unit has been maintained at a nearly constant level.

There has been a constant search through the years for new ways of increasing thermal efficiency, and the improvement is shown in Fig. 1 which indicates the stations in this country with the best performance from 1922, when records were first available, to the present day. There was a general falling-off in the efficiency of British power stations as a whole during the war, as few major stations were built and the existing stations had to operate with coal supplies gradually deteriorating in quality while maintenance problems were accentuated by increasing electrical demands.

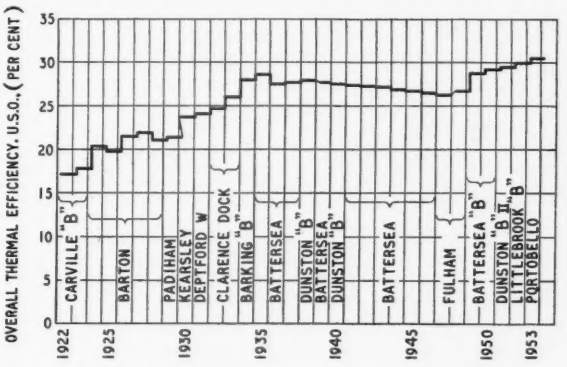


Fig. 1.—Most efficient British generating stations, 1922–1953

Information as to when station thermal efficiency figures were first compiled is not readily available. The first reference to coal sampling appeared in the *Electrical Review* of 10th November, 1893, in a report of a paper read before the Engineering Congress, Chicago, by George H. Barras, entitled " A Coal Calorimeter."

Boiler Efficiency

The station thermal efficiency can for present purposes be split up into its main component parts, boiler efficiency and turbine efficiency. Boiler evolution in station generation has grown from batteries of Lancashire or similar boilers, to the water tube boiler starting with modest evaporative capacities and now reaching 1,400 klb/hr: the limit in size has by no means been reached. Each increase in pressure, temperature and capacity has brought its own problems. Trevithick, by substituting a cylindrical shell (the Cornish boiler) for the square type in use at the time (about 1810) enabled pressures to be raised from 6 to 150 lb/sq in.

The basic need is for efficient performance over a wide range of loads, keeping constant steam conditions. The travelling grate stoker is giving way to pulverized fuel firing mainly because of flexibility and a higher efficiency which offsets the additional auxiliary power required by the mills and associated fans. Failure to obtain suitable grinding results in losses due to high carbon content in the ash. A new development is the cyclone furnace with a pressurized combustion chamber. Advantages claimed here lie in the lower auxiliary power required, a higher heat release per unit furnace volume, and the fact that most of the ash is collected in the furnace bottom instead of passing through the boiler.

Boiler design requires a nice balance between the various heat exchanges which take place in the furnace walls, superheater, economizer and air heater, and it is difficult to see how the heat now lost in the flue gases could be usefully employed. It appears therefore that with regard to efficiency, present-day boilers have nearly reached their maximum. There is a tendency, in order to attain a low final gas temperature, to accept the fact that corrosion occurs and to design the air heater in two parts, so that the portion subject to corrosion by low-temperature flue gas can easily be replaced when required. It sometimes happens that the actual performance of a boiler falls short of that specified; for example, the final gas temperature may in practice be appreciably higher than should be the case. It would seem worth while therefore to make provision in the boiler design for modifications in the proportions of the heating surface.

Coal is not only a fuel but a valuable chemical, and while in recent years the electrical demands of this country have required an urgent and immediate extension of plant, to the exclusion of all other considerations, there does seem to be the opportunity, with new techniques, to turn again to the low-temperature distillation of coal. It should be possible to design a boiler, large enough for present-day requirements, which will first release the volatiles for separate collection, and then use the hot residual fuel for steam raising, maybe in a continuous process. A small early experimental distillation plant at Dunston was abandoned about 1932 due to the unfavourable economic conditions arising out of the world slump.

Turbine Efficiency

Turning now to the turbine, there are several developments which have had, and will have, the effect of improving efficiency, e.g., steam condensing, regenerative

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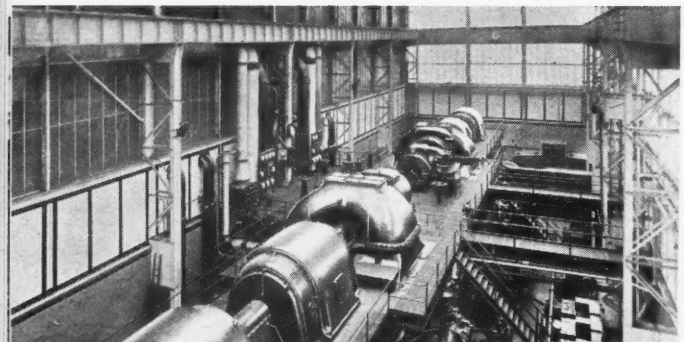


Photo by courtesy of Controller, C.E.A. North Eastern Division

North Tees "A" power station built in 1922 with two 20 MW machines

feed-heating and steam reheating, multiple exhausts, and devices for removing moisture from the steam in the region of the l.p. exhaust; new blading materials based on gas turbine practice to stand up to the higher temperatures which are now being used; and the noticeable increase in the size of the turbines. This is important, as the larger the machine, the smaller relatively, become the " no-load " losses. A further considerable development which affects the alternator efficiency is the use of hydrogen cooling, which results in lower windage and fan losses.

The first great practical contribution to the improvement of the steam cycle efficiency was Watt's patent of 1756 which provided for the condensation of steam in a separate vessel. This was followed some sixty years later by Trevithick's patent of a closed steam cycle including a surface condenser. The use of steam condensers therefore considerably antedated the construction of the first electrical generating stations, so that even the very early power stations, with a few exceptions, worked on a condensing cycle.

With the increase in size of turbines the volume of steam at the exhaust has increased, improvement in condenser design reducing the absolute back pressure which in its turn increases the volume of steam to be dealt with. Features of importance here are the length of the blades on the last stages of the turbine rotor (limited by centrifugal stresses), the effect of moisture droplets forming in the steam, and the temperature of the water available for cooling purposes. The blade height limitations are to some extent solved by recourse to double and even triple exhausts to the condenser. A further improvement with the increasing size of blading on the final stages is the use of " vortex," or skew, blading.

Moisture in the final stages of the turbine rotor is serious because the droplets are so much denser than the steam which carries them, and the velocity with which they travel is considerably less than that of the steam. Hence not only does the moisture tend to erode the blades of the last stages, but it has a braking effect. To mitigate these effects, modern practice introduces devices to trap the droplets thrown off the blading so that they are removed, as they are formed, from the path of the vapour. Steam reheating contributes to a partial solution in that the wetness fraction at the turbine exhaust is appreciably less than that obtained with non-reheat conditions.

Feed-heating appears to have been practised at the end of the last century on locomotive boilers when the exhaust steam was used to heat the feed water, and the use of bled steam for a similar purpose was covered by a patent of G. & J. Weir as early as 1876 which referred to multiple expansion steam engines and was regarded as an alternative to economizers. The idea of improving the efficiency of a steam cycle was referred to in a number of papers in British and foreign periodicals between 1890 and 1897, and in 1906 Ferranti (B.P. 14692) patented a cycle for steam turbines with regenerative feed-heating when using boilers without economizers. In 1915 Baumann (B.P. 3151 and 16432) covered feed-heating with economizers on the boilers, and in 1916 the first feed-heating turbine was ordered for the Blaydon Burn station of the old Priestman Power Co. in which both Merz & McLellan and the Newcastle-upon-Tyne Electric Supply Co. were concerned. Two years later the turbines at Carville " B " were converted to single-stage feed-heating.

It appears that Ferranti received patents for various reheating cycles, and that he and Sir Charles Parsons collaborated closely in much of the pioneer work on these cycles. It would also appear that the first patent for reheating was taken out in France by M. Normand in 1865. However, Parsons tried reheating experimentally in 1900 on the Elberfeld machine though without success, and the Ferranti patents followed shortly after. The first actual reheat installation was also at Blaydon Burn which had a gas-fired reheater, and this was followed by an experiment on one of the Carville " B " machines using live steam as the reheating medium. There was a slight improvement in the heat consumption, but it was too small to warrant its continued use.

A considerable advance was made in 1922 at North Tees " A " station, the first to incorporate multi-stage (three) feed-heating and also reheating. At this station, again, it was found that the gain in efficiency was not economically justifiable, principally owing to the steam cycle in use (450 lb/sq in, 650 deg F, reheat from 400 deg to 500 deg F, at m.c.r.) and to the fact that the reheating was not carried up to a sufficiently high temperature. By present-day standards the boilers were small (five reheat, 37,500 lb/hr evaporation, and five non-reheat) which complicated the reheating steam piping. Also, it is worth noting that the time these sets were built, 10 MW was the largest size of alternator obtainable, so that with turbines of 20 MW capacity it was necessary to have two alternators in tandem. When we read some 32 years later that a 275 MW alternator is being built in the United States, it brings home clearly the phenomenally rapid growth in the size of electrical generating plant.

The next developments in reheating came in 1933 with Dunston " B " and its three 50 MW sets. Then came Brimsdown " A " in 1938 (52·5 MW) and Brimsdown " B " h.p. (60 MW) in 1940; Dunston " B II," two 50 MW unit sets, followed in 1950, and Littlebrook " B " in 1953. Other reheat stations have been built and are planned, but reheating has not so far been pursued here with the same zest as in the United States.

Works Power

The sum of the energy required to operate the station auxiliaries and general services, including the miscellaneous requirements of the ash and coal plants, varies from about 5 to 7 per cent of the station generated output, representing about 2 per cent decrease in the station generated thermal efficiency. Under this heading come the boiler auxiliaries which, without the feed pump, amount to about 3 per

cent of the boiler heat input. The turbine auxiliaries include the extraction and circulating water pumps, and the alternator cooling air fans.

The characteristics of the auxiliary plant are decided in the design stage, but after commissioning it is possible to see how these auxiliaries can be operated most efficiently, bearing in mind that they have a margin above the actual requirements. For example, a choice can be made, guided by operational needs, as to whether one or two alternator cooling fans will suffice or whether, for example, two p.f. mills can be used instead of three. Another point worth considerable study is the most economical method of running the circulating pumps where a number of pumps supply a common bus main to a number of turbines. Where there is a valve on the c.w. outlet from the condenser this is usually throttled in so as to maintain syphonic action, but there is a fairly critical setting of the discharge valve if the maximum amount of circulating water is required.

Other variables to be considered here are the number of such pumps to be run, the economic turbine back pressure with its related condensate temperature, and the temperature of the circulating water inlet.

Influence of Load Factor

Every boiler and turbine has an optimum efficiency at a certain load, and any departure from this load means that the thermal efficiency is decreased, the main reason being the "no-load" power required by the plant before it commences to generate a single unit. A turbine, for example, takes about 6 per cent of its steam requirements to turn the shaft at the required speed and to operate the governor and oil pump gearing; the necessary auxiliaries too must be operating before generation can commence. As the load increases the no-load power requirement, which remains constant, becomes a progressively smaller percentage of the generated output. A similar reasoning applies to the boiler. Therefore any departure from the economical rating results in a reduction in the thermal efficiency. Also, when a station operates on a two-shift basis, as distinct from continuous running, there is a further reduction in the station efficiency due to losses incurred by starting up and shutting down, and by keeping boilers on "standby" conditions. The losses

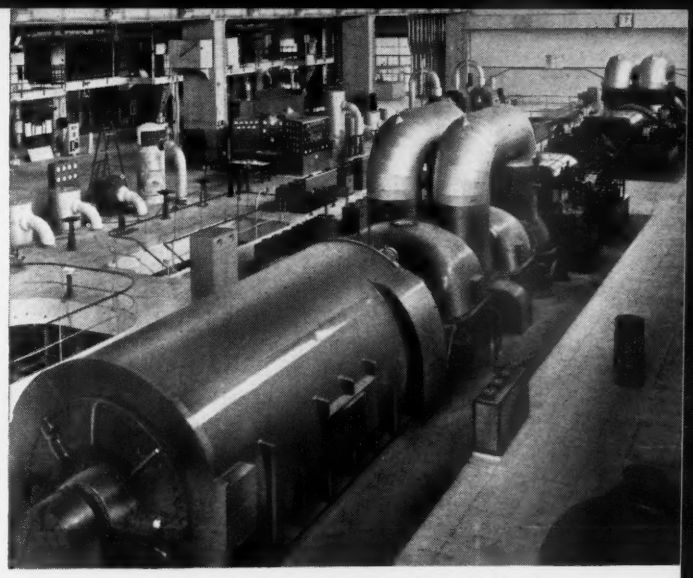


Photo by courtesy of Metropolitan-Vickers

Littlebrook "B" built in 1953 with two 60 MW hydrogen cooled alternators, the first in this country

here are due to the heat required for warming up the boiler and turbine, drain and radiation losses, and by the auxiliaries running during the starting-up periods when there is no generation, and also, while bringing up load, which may take an hour or so, the machine is generating less efficiently until it reaches its economical rating.

An interesting investigation was carried out recently at Rye House, a new station in the Eastern Division, to determine the difference in the thermal efficiency when running continuously for one week, and when running on the normal two-shift basis. Comparative figures are given in the appended table, those for the two-shift operation (shown first) being a mean of four weeks, two before and two after, the week's continuous run.

	Units sent out	Coal (tons)	Relative Cost/U.S.O.	Eff. U.S.O. per cent
Two Shift :	8,965,000	4,735	105·9	25·73
Continuous :	13,712,000	6,837	100	26·56

This shows that an additional 4,747,000 u.s.o. were obtained by an extra 2,102 tons of coal, the cost per unit for these (using the same value for the coal cost per ton) showing a reduction of 16 per cent. The works power as a percentage of the units generated was reduced by 8·3.

A plot of station weekly efficiencies against load factor gives a very considerable scatter and even on a monthly basis this scatter still persists, as a number of other factors introduce changes in the efficiency figure from week to week. To name a few, there is the quality of the coal burnt, changes in the c.w. inlet temperature, and operational factors introduced by plant outage causing boilers or turbines to be operated at other than their economical rating. One fact standing out very clearly at a station which uses estuary water, is the way the thermal efficiency follows (inversely) the c.w. inlet temperature. This emphasizes the need of operating the cooling water circuit to best advantage. It is not possible, for the reasons noted above, to show a relation between load factor and thermal efficiency but Fig. 2 shows an approximate relation between the thermal efficiency (assumed to be influenced by the load factor) and the cost/u.s.o. based on the fuel price plus handling charges, for several Eastern Division stations of the C.E.A.

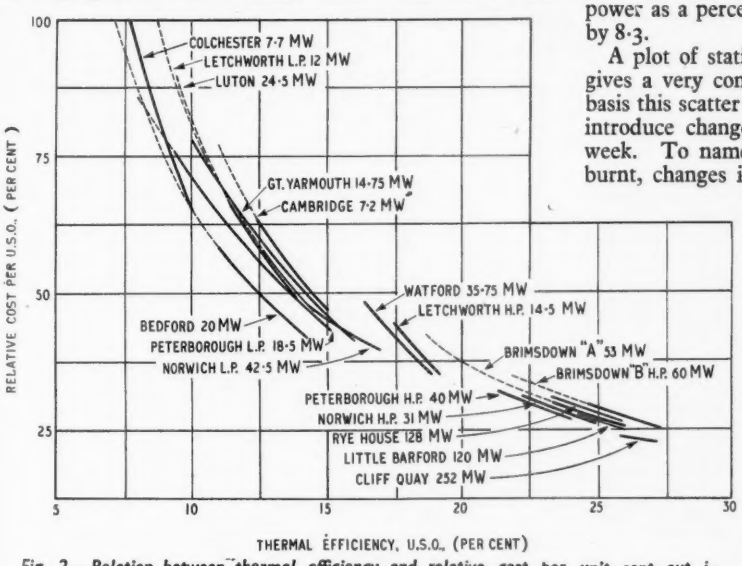
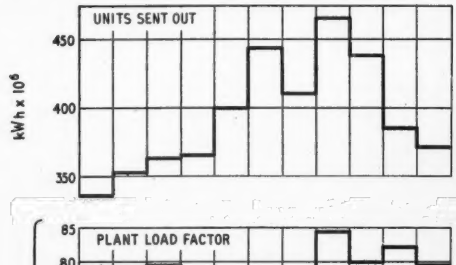
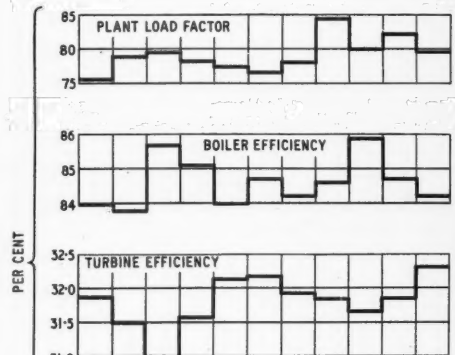
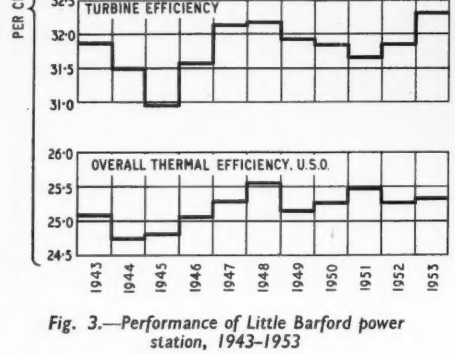


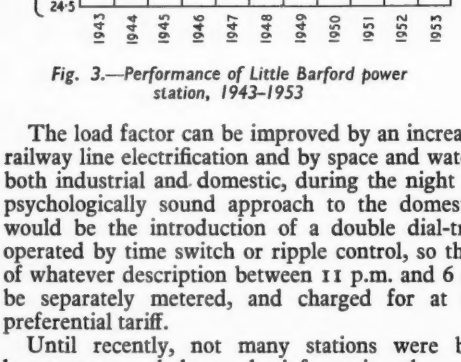
Fig. 2.—Relation between thermal efficiency and relative cost per unit sent out in the Eastern Division, C.E.A.

Fuel costs vary from station to station. The full lines show the normal variations in station efficiency. Broken lines indicate very occasional departures from normal operation.









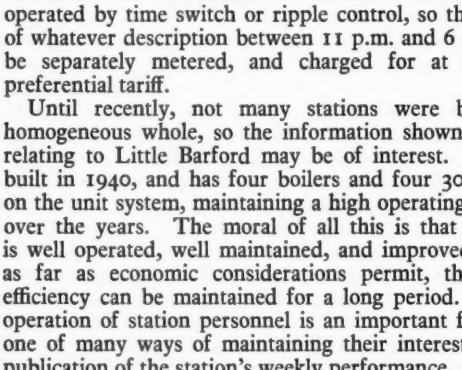


Fig. 3.—Performance of Little Barford power station, 1943–1953

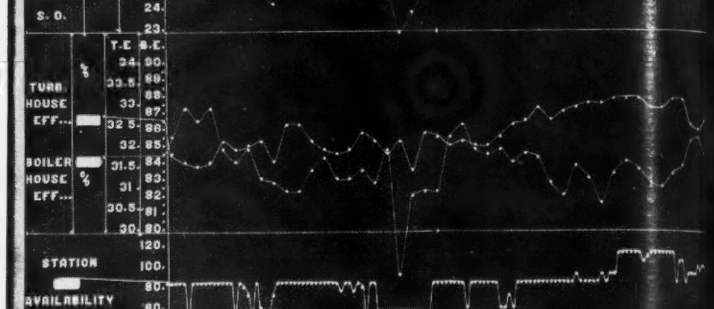


Chart exhibited in Little Barford power station, showing the weekly operating results

The load factor can be improved by an increase in main railway line electrification and by space and water heating, both industrial and domestic, during the night hours. A psychologically sound approach to the domestic market would be the introduction of a double dial-train meter operated by time switch or ripple control, so that all load of whatever description between 11 p.m. and 6 a.m. could be separately metered, and charged for at a suitable preferential tariff.

Until recently, not many stations were built as a homogeneous whole, so the information shown in Fig. 3 relating to Little Barford may be of interest. This was built in 1940, and has four boilers and four 30 MW sets on the unit system, maintaining a high operating efficiency over the years. The moral of all this is that if a plant is well operated, well maintained, and improved in detail as far as economic considerations permit, the thermal efficiency can be maintained for a long period. The co-operation of station personnel is an important factor, and one of many ways of maintaining their interest is in the publication of the station's weekly performance. A photograph is reproduced of a chart which has been in use for some years at Little Barford, and is displayed in a prominent position in the engine room. Similar charts are displayed in other stations.

Future Developments

Looking to the future, the limits in size, pressure and temperature have not yet been reached, as American progress indicates, although present indications with regard to atomic energy are that more moderate steam conditions will be employed. The technical advances relating to steam generation, atomic reactors and gas turbines are becoming more interdependent, and will surely lead to interesting developments. In the more distant future, as has already been forecast, it may be possible when more is known about the behaviour of the atom, to have atomic power in " packaged " fuel cells, any size to order. This may mean that our " pylons " may no longer be a feature of the skyline.

Acknowledgments are due to a number of colleagues who have helped with information for this article, particularly to Mr. W. W. Campbell (Merz & McLellan); also to Mr. W. N. C. Clinch, Controller, for permission to publish information relating to the Eastern Division.

Telephone Expansion

THE Telecommunication Engineering and Manufacturing Association has just issued its first annual report (for 1954-55) giving a general review of the work of the Association and of the telephone service in Great Britain.

The principal interest of the members lies in the telegraph and telephone industries and the facts summarized in the report show how badly off Great Britain is as regards telephones compared with many overseas countries. Here there are 12·15 per 100 of population compared with 31·27 in the United States, 24·01 in Canada, 21·90 in Switzerland and 16·07 in Australia. Moreover, the percentage increase in installations in this country last year was less than in any of the countries quoted. It is evident, the Association says, that the Post Office can safely budget for a much greater increase than the present rate for many years to come.

Emphasis is placed on the enormous unfulfilled demand for telephones before saturation is reached and the consequent need to plan boldly for future development, and in this connection reference is made to the report of the Bridgeman Committee in 1934. This recommended " self-contained " finance for the Post Office, divorced from Treasury control, and a consequent reorganization was under way when the last war broke out but was then abandoned. It is felt that similar action should once more be initiated.

The report summarizes the Post Office accounts and statistics in this country and similar figures for the U.S.A. and concludes with a list of the outside activities of the Association itself.

PARLIAMENTARY REPORT

Speedier Railway Electrification Advocated

A much bolder and speedier scheme for the electrification of the railways was advocated by several M.P.s during the debate on the British Transport Commission's report and accounts for 1954. Mr. David Renton said it was a pity that the debate was taking place before the debate on the coal industry because then the House would have known more clearly what was to be the future of the railways in the use of fuel. The fact must be faced that the steam locomotive was about the most wasteful user of best coal known in the world. Its fuel efficiency was only 6 or 7 per cent. If it were replaced by electric power the efficiency would be at least 20 per cent, even when allowance was made for the wastage in electrical distribution.

Seven months ago when the modernization plan was before the House, Mr. Renton added, it was regarded as a welcome and vital document, but on second thoughts he was disappointed about some of the proposals, especially those for electrification. Apparently the steam engine was to go on pouring out valuable fuel for many years to come. The country could not afford this waste. Under the plan only £185 million out of £1,240 million was to be spent on electrification and only £150 million on "dieselization," spread over the next fifteen years. That was much too modest. He hoped that the Government would have second thoughts about this plan.

Mr. Geoffrey Wilson agreed that the plan did not go far or fast enough. It would be a good thing, he said, if the electrification of the railways could be intensified both as to time and extent. He was credibly informed that the British electrical industry could, if asked, supply greater quantities of materials and that the necessary loads could be met by the C.E.A. without any interference with other industries because most of the demand would come at off-peak times. Electrification would answer many of the problems of the railways. On sections already electrified there had been a considerable increase in traffic. Unless the railways could stand on their own sleepers—if that was the right phrase!—it would be better to pull up the rails and replace them by motorways.

Replying to the debate, the Minister of Transport, Mr. John Boyd-Carpenter, made no specific reference to electrification. He said that the re-equipment of the railways, which was a counterbalance to the elimination of unremunerative lines, was going ahead well. In the year under review more railway wagons were ordered than for the previous 30 years and new locomotives, an increasing proportion of them being diesel-propelled, were being ordered. The new diesel trains which would be run between Edinburgh and Glasgow, Birmingham and Swansea, and London and Hastings, would be coming along in the next year or two. Similarly suburban services in many areas would be improved, including the service running out of Manchester and serving smaller towns between that city and Crewe. There was also the electrification to the north-east of London. Those schemes were going ahead because it was clear that on the routes where there was a remunerative future the chances of the railways earning a proper living turned on them being properly equipped.

Fuel Policy

The Minister of Fuel and Power faced severe criticism of his policy from both Conservative and Labour Members at question time last week. When he told Brig. Clarke that the present loss on imported coal exceeded the premium on exported coal by about 30s a ton, the brigadier commented that the Minister was getting nowhere with his fuel and power policy, and would finish up by bankrupting the country. Mr. Lloyd said that the Government was considering what the import-export policy should be next year.

Answering a question from Mr. Nabarro, the Minister said that power stations used 41·5 million tons of coal, of which 3 million tons was imported, in the past twelve months. Consumption might rise to 44 million tons in the next year. The Central Electricity Authority made no direct purchases of foreign coal.

Mr. Nabarro then asked why, if the C.E.A. wanted to, it should not import coal direct and lose the money direct, rather than cause the Coal Board to do so.

Mr. Palmer asked if it was a fact that the C.E.A. was prepared to buy coal from overseas at the world price.

Mr. Nabarro said that when the pits were nationalized no one envisaged that Great Britain would be the world's biggest coal importing nation, and in view of the protests from both sides of the House, would the Minister review the whole present iniquitous policy?

Mr. Lloyd: "I think it is right that the price should be averaged as it is and that the N.C.B. should be the importing authority. It is not a fact that we are the largest importer." Mr. Lloyd thought it was fair that the price of imported coal should be fixed so that it would sell at the same price as British coal.

Miss Jennie Lee said there would be growing resentment in the coal industry until coal was allowed to find its natural price.

Later in the week, Mr. Nabarro, the Government's severest critic, resigned from the joint secretaryship of the Conservative Party Fuel and Power Committee. He stated in a letter to Col. Lancaster, chairman of the Committee, that he did this because he found himself in conflict with the Minister of Fuel and Power on fuel policy. Mr. Nabarro will continue as vice-chairman of the Party's Atomic Energy Committee.

Mr. Nabarro was expected to take a prominent part in the debate on the coal industry this week (20th July).

Curing Kippers

Mr. Bevins, Parliamentary Secretary, Ministry of Works, informed Mr. Dodds that experiments on a small scale were being conducted at the Torry Research Station of the D.S.I.R. on an electrostatic method of curing kippers. They had shown promise of a substantial saving in time compared with the process of curing by oak-chip fires. It was hoped to try the new method on a factory scale next year, and that the result would be more palatable kippers.

Atomic Power and Transport

Mr. Peart asked the Secretary of State for Foreign Affairs if he would ensure that M.P.s were kept fully informed of any further developments in connection with the proposed six-Power conference on a European organization for atomic power and transport and that no decision would be taken by the Government which committed this country to any integration, or approved of it, until the House had fully discussed the proposals.

Lord John Hope, Under Secretary, Foreign Office, said that the House could rest assured that nothing rash would be done.

Mr. P. Noel-Baker asked whether the Government's White Paper on this subject, published on 5th July, included the remarkable report prepared by M. Armand, of the French Railways, on Europe's fuel resources, and if not, would the Government publish it as a White Paper.

Lord John Hope said he would look into that.

A.E.A. and C.E.A.

Mr. Palmer asked the Minister of Fuel and Power why it was necessary to have two separate authorities—the Atomic Energy Authority and the Central Electricity Authority—both engaged on the construction of nuclear power stations, not only for electricity but the plutonium by-product as well.

Mr. Geoffrey Lloyd said the reason

was that one set of reactors was primarily for the supply of electricity through the grid to the public, and the other set was partly for the manufacture of plutonium and partly for the supply of electricity and, therefore, more properly controlled by the Atomic Energy Authority.

I.O.W. Television Station

Dr. Charles Hill, Postmaster-General, informed Sir Peter Macdonald that the television station at Rowridge, in the Isle of Wight, would be brought into permanent use by the end of this year.

Hire-Purchase Statistics

Mr. Roy Jenkins asked the President of the Board of Trade whether he had now completed his plans for compiling hire-purchase statistics.

Mr. Peter Thorneycroft said that he had. Consultations had taken place and were continuing. Retailers and finance houses were to be invited to co-operate in supplying statistics which would show the monthly changes in hire-purchase sales and debts outstanding for the main types of goods sold on hire-purchase. It was hoped to start collecting these figures in the autumn.

Valves and Cathode-ray Tubes

Mr. Arthur Lewis asked the President of the Board of Trade, whether, as radio wholesalers carried on restrictive practices affecting the supply and distribution of radio valves, and tubes, etc., he would add to the terms of reference of the Commission now investigating radio valves and tubes a requirement to investigate the restrictive practices of this trade.

Mr. Thorneycroft said that the reference already before the Commission covered all aspects of the supply of electronic valves and cathode-ray tubes.

"Automation" and Purchasing Power

Mr. Allaun asked the Chancellor of the Exchequer if, in view of the spread of automation, he would reconsider his economic policy to ensure that sufficient purchasing power was secured by the people to absorb the increased production.

Mr. Butler said the economic policy of the Government was constantly reviewed to take account of current developments. At present he saw no signs that purchasing power was insufficient for our production. He added that the difficulty at present was not unemployment but that there were more unfilled vacancies than there were unemployed.

Reduced Exports

Mr. Arthur Lewis asked the President of the Board of Trade if he was aware that the monthly average export of bicycles, vacuum cleaners, electric washing machines, radio sets and radiograms, china, carpets and rugs, was now less than in 1951; that there had been a consistent falling-off in the quantity of these goods exported since 1951 whilst, at the same time, more of these articles were going on to the home market; and what action he proposed to take with a view to restoring the export of these goods to the 1951 level.

Mr. Thorneycroft said that exports of these goods fell from a high point in 1951 to a low point in 1953, partly because of import restrictions imposed by other countries, but they had since been rising. The Government's policy of stability at home and the removal of barriers to international trade was designed to assist exports.

Scottish Debate

Nuclear power station developments in Scotland were welcomed by the Secretary of State for Scotland, Mr. James Stuart, at the end of the debate in the House of Commons on Scottish affairs. He said that the Atomic Energy Authority's plant at Dounreay was reaching the stage in construction at which it would provide work for considerable numbers and bring substantial benefit to the area. The estimated peak was 1,700 towards the end of 1956 but, as it was intended to add further experimental reactors to the site, at times dependent upon progress in development, a sizeable construction staff was likely to be employed for several years.

Outside the Highlands, the Atomic Energy Authority had chosen Chapelcross, near Annan, as the site for four of the six new reactors it was to build. The construction of these would, of course, provide considerable employment locally and would provide a welcome addition to our electricity supplies. But their long-term value was even greater. We were at the beginning of very great developments in this field throughout the world, and vast capital sums would be invested within a matter of years. Now was the time, therefore, for our industrialists to make sure that as much of the work as possible went to Scotland, and that they acquired the necessary "know-how."

Referring to the Government's efforts to attract new industries to Scotland, the Minister of Works, Sir Walter Monckton, said that the building of atomic breeder reactors and the experiment in generating electricity from peat would provide employment in the isolated county of Caithness. In October, 1952, the Government decided to give financial assistance to industrial projects in the Buckie and Peterhead areas. Two projects had recently been approved; one was at Peterhead, by the Peterhead Gear Co., Ltd., which had been helped to extend its premises; the second was at Buckie, where a new factory had been put up by Associated Electrical Industries, Ltd.

Mr. Walter Elliot said that the delusion that peat was a prime mover had led to many fortunes being lost.

Mr. J. R. H. Hutchison asked what progress was being made in obtaining electrical power from peat. It was true that experimentation was going on in connection with gas-turbine plants both by John Brown & Co. and by Ruston & Hornsby, but the situation brooked of no delay. Whether from atomic energy or, in a small way, from peat, contributions were needed urgently to satisfy the great hunger for electric power.

Mr. John Macleod said that in the Highlands people were anxious to provide accommodation for tourists but without electricity they could not do all they would like to. The Hydro-Electric Board was asking for guarantees which were far too high. Why should that be so to-day when the people in the Highlands were using far more electricity than the Board ever expected? There was no need for the Board to demand any guarantee at all because they knew that once electricity was brought to an area it would be well used.

Mr. Patrick Maitland, the Member for Lanark, said he was disappointed to find that the new nuclear power stations were all going to one area.

Sir David Robertson said the Government deserved great credit for having had the courage to go to the allegedly remote Pentland Firth area to create a breeder reactor for industrial purposes. It gave him great pride to see the transformation being made at Dounreay.

Mr. James Hoy condemned the slashing attacks which had been made in the past on the Hydro-Electric Board by Mr. Gerald Nabarro. The Board had brought great benefits to thousands of people. Even to-day it employed 12,500 people, thus making a distinct contribution to employment, and its existence had resulted in the starting of industries which had increased the export trade. Not only that, but in a short time 130,000 customers out of a potential 200,000 when it took over were now receiving supplies. Here was a tremendous record of service, he said.

Battery Railcars

Sir Robert Boothby asked the Government to get the British Transport Commission to try out battery railcars or diesel railcars on the branch lines in Scotland which were being closed down. That the line from Aberdeen to Macduff, in one of the great agricultural districts of this country, should still be open for goods traffic but closed for passenger traffic was a monstrous and unjustifiable thing, he said. He asked the Commission to give serious consideration to using for passenger service the E.T.A. 176 railcar which was produced in Germany in 1952. Operating at low cost, it had had an astonishing success. He had seen quite a lot of railways in France and Germany in

recent years and it was a shaming experience to see these little railcars running about the branch lines like cars, stopping at all the stations, and making money. He asked for an unbiased investigation.

Captain J. A. L. Duncan, supporting the plea, said that Dr. Kreissig of the German Railways had given details about the cost of operating diesel cars as opposed to steam locomotives in Germany. Taking depreciation, wages, fuel and maintenance into account, the German figure was the equivalent of 1s 4¼d per train-mile for the rail-bus running solo, and 2s 2½d if a trailer was used for additional accommodation; this was 0·478d and 0·33d per passenger-mile, respectively. That compared with 8¼d per passenger-mile for the equivalent steam train.

Mr. Hugh Molson, Parliamentary Secretary, Ministry of Transport, replying for the Government, said he had figures and facts which tended to show that battery railcars were not normally any more efficient than light diesel vehicles. The first disadvantage from which they suffered was the same as that suffered by the old electric broughams: the tremendous weight of the battery as compared with the weight of the vehicle. The battery railcars that would be needed for one branch line would cost £50,000 because they had to be built of a specially light alloy on account of the weight of the batteries. They were only comparable in efficiency with diesels provided that they were able to be recharged at a cost of not more than ¼d/kWh. The Transport Commission had been quoted the price of 2·1d for recharging the batteries by the Hydro-Electric Board. The Commission was prepared, however, to undertake experiments provided that the Hydro-Electric Board contributed to the cost and was prepared, if the experiments were satisfactory, to continue to recharge batteries at ¼d/kWh.

Policy on Restrictive Trade Practices

The Government's proposals for dealing with collective trade practices were outlined by Mr. Peter Thorneycroft, President of the Board of Trade, when the House of Commons debated the Monopolies Commission's recent report on collective discrimination (see *Electrical Review*, 8th July).

Giving a brief review of the report, he said it was not primarily concerned with either price maintenance or price rings as such, but with a network of discriminatory practices mainly used for enforcing or pursuing these or other objectives. He reminded the House that he had already announced his intention to refer price rings to the Commission.

The fixing by manufacturers of the retail prices of their goods had been examined by three separate committees over the last thirty years and individual "price maintenance" had never been condemned in any of them. Manufacturers, distributors, consumers and the trade union movement all gave evidence that this was in the public interest. The dilemma which faced the House was that there was a powerful body of support for the individual fixing of retail prices while, at the same time, for many of the goods the only effective method of enforcement was the collective arrangements which the Monopolies Commission had condemned by a six-to-four majority and which were condemned by the Lloyd Jacob Committee.

The Government believed that the sensible course was not to declare resale price maintenance to be illegal, nor to abolish it fortuitously by the removal of all methods of enforcement. The right course was to examine urgently whether some other method could be devised for maintaining prices individually fixed, taking price-cutters where necessary to the courts in the last resort, which was less open to criticism than the network of practices to which the Commission referred.

The Government intended to take power by Act of Parliament to require the registration of those restrictive practices which they would from time to time specify and they would not limit themselves to those mentioned in the report. They would not require that all restrictive practices should be registered together, otherwise all would be lost in a sea of paper. The Government would select the ones they wanted and in what order. That was the Swedish practice which had met with success. They would include for early registration all those referred to in the Monopolies Commission's report and also agreements fixing common prices. A tribunal, with the information which the register would make available, would call upon firms who wished to operate or to continue to operate a collective arrangement to come forward and make out their case for employing the particular practice involved.

The crucial issue was whether these practices in restraint of trade should be declared crimes. The answer seemed to be to place the onus of showing that a practice was in the public interest fairly and squarely on the men who wished to use it. The applicant would argue his case in front of the tribunal, said Mr. Thorneycroft, and if it decided in favour of him, he could go on, subject to any conditions or modifications which might be laid down, but if it decided against him, then the practice he was operating must stop.

Electricity Supply Investment

In reply to Mr. Nabarro, the Minister of Fuel and Power (Mr. Geoffrey Lloyd) gave the following figures for the annual capital investment by the Central Electricity Authority and Area Electricity Boards year by year from 1st April, 1948, to 31st March, 1955, and the average annual load factors at C.E.A. power stations:—

	C.E.A. (£ millions)	Load factor per cent
1948-49	95·0	43·76
1949-50	117·2	44·35
1950-51	128·6	47·13
1951-52	141·7	46·87
1952-53	153·8	44·69
1953-54	169·8	43·92
1954-55	202·9 (provisional)	45·20

The Minister added that capital expenditure of £197·9 million and £204·5 million had been authorized for 1955-56 and 1956-57 respectively. No subsequent authorization had as yet been given by the Government.

Battery Railcars

Mr. Thomas Johnston, chairman of the North of Scotland Hydro-Electric Board, commenting on Mr. Molson's statement about battery railcars on Scottish branch lines, says that the information supplied to the Joint Parliamentary Secretary to the effect that the price quoted by the Hydro-Electric Board for the recharging of electric railcar batteries is 2·1d per kWh and that the Transport Commission's comparable price for diesel charging of batteries is ¾d per kWh is not understood. The 2·1d per kWh figure is especially mysterious seeing that the Board's published tariff for the charging of batteries for vans and other road vehicles is 1·2d per kWh. The Board has never been asked to give a price quotation for an experiment or, if the experiment be successful, a price for continuous running thereafter. What it has done is to urge the desirability of an experiment with a battery-driven railcar on a branch line. It is both willing and anxious to discuss details with the Transport Commission at any time.

PRICES OF MATERIALS

In the accompanying table we give the basis prices of the more important materials used in the electrical industry. The figures given are the selling prices and are those quoted on Tuesday last.

ALUMINIUM Ingots	ton £171 0s 0d
COPPER, H.C. Electro	ton £354 10s 0d
Fire Refined 99·70%	ton £353 0s 0d
Fire Refined 99·50%	ton £352 0s 0d
COPPER Tubes ..	lb 3s 3½d
Sheet	ton £410 5s 0d
H.C. wire and strip ..	ton £390 5s 0d
LEAD, English ..	ton £106 15s 0d
Foreign	ton £105 0s 0d
MERCURY	flask £108 0s 0d
TIN, block (English) ..	ton £758 10s 0d
ZINC, G.O.B. Foreign	ton £91 15s 0d
Electrolytic	ton —
BRASS Tubes (solid drawn)	lb 2s 8½d
Sheet	ton £327 5s 0d
Wire	lb 3s 3d
PHOSPHOR BRONZE Wire	lb 4s 10½d
PLATINUM	oz £29 0s 0d
RUBBER, No. 1 R.S.S. spot	lb 37½d—38d

INDUSTRY AND THE HOUSE

By A. M. F. PALMER, A.M.I.E.E., M.P.

POOR Mr. Lloyd! Neither life nor the House of Commons was kind to him last Monday, for there is a pleasant custom which ensures fair shares of questions to all Ministers by moving the order of batting each week so that each in turn is first to face the bowling. And it was hard on Mr. Lloyd that his time should come so inconveniently close to the announcement of the increases in the price of coal.

Fuel and Power critics from both sides of the House had covered the first two pages of the order paper with all manner of inquiries probing into the financing of coal imports, the economics of fuel utilization and alternative sources of energy. But in addition the news had gone round that the benches behind the Minister of Fuel and Power were thick with his theoretical party friends now hungry for a scapegoat. No one could blame the Labour Opposition, normally the supreme masters in the not so gentle art of dissension, if they looked forward with sly enjoyment to the prospect of gaping rents in the ordinarily solid front of parliamentary Conservatism. As it turned out no one could have decently claimed afterwards that they did not get their full money's worth of schism.

Coal Prices

Labour's Mr. Douglas Jay opened sweetly, by asking if the Minister would give a general direction to the National Coal Board to sell coal to industry in the United Kingdom at "world prices." His reward was only the stonewalling answer that there was "not really a world price of coal in the classical sense." Now the battle was well and truly joined, for Mr. Jay's supplementary question demanded to know why industry was subsidized by receiving from the Coal Board cheap fuel bought dearly overseas? To this Mr. Jay received no real answer at all, his only satisfaction being the loud supporting cheer from his own benches, which cheer continued to a crescendo when Brigadier Clarke attacked from below the gangway on the Government side.

The Brigadier like Mr. Nabarro, his comrade-in-arms on this memorable day, has a voice that would be the envy of any toastmaster; one suspects also that the Brigadier is prepared to walk through a door if the key is not readily available. In thunderous tones he asked if the Minister realized that he would get nowhere with his present policy and would probably finish up "by bankrupting the country." Before Mr. Lloyd's almost inaudible answer could be appreciated the gallant Member struck again. Would His Right Hon. Friend fix the price of domestic coal in the south at the same figure as in the Midlands? The not unexpected reply of "No" brought the harsh charge that present fuel policy was "ruining the old-age pensioners." Whether this be the case or otherwise the House sensed that such familiar brotherly strife might easily ruin the Government, an impression which Mr. Nabarro was obviously anxious to strengthen further when he strode from the chamber in apparent anger after a barbed gibe at the Minister's "so-called fuel and power policy."

Apart from encouraging the Government's family squabbles the Opposition, as their own questions showed, is preparing for a major onslaught in the coal debate soon to take place. There is proper concern about the state of the coal industry and its failure to increase production on the scale required to meet industrial and domestic needs. In addition, there is plentiful evidence to show that fuel conservation has not made the progress that the urgency of the present situation demands.

As is now the standard practice, a special debate on the transport situation was staged, using the seventh annual report of the Transport Commission for a pretext. The Parliamentary Secretary, Mr. Hugh Molson, opened in a speech described later by his vigorous Labour opponent, Mr. James Callaghan, as reminding him of the "smooth flowing, placid waters of the Kennet and Avon Canal."

Mr. Molson said the Government and the Transport Commission attached special importance to the new merchandise charges scheme under consideration by the Transport Tribunal. The intention was not to increase charges further but to give British Railways "greater flexibility" in fixing charges. He hoped the scheme would come into effect at the beginning of 1956. It should assist tremendously in rationalizing road and rail traffic.

The Parliamentary Secretary went on to point out that in spite of the sale of lorries British Road Services receipts fell only to £8,700,000 in 1954 compared with £8,900,000 in 1953. This he thought was due to improvements in operational efficiency and reduced maintenance costs.

Most of Mr. Callaghan's remarks were devoted to challenging the Government's policy on de-nationalization of road transport. He found an ally in Mr. Godfrey Nicholson, Conservative M.P. for Farnham, who believed that the trunk network rendered a great and valuable service to the nation; he hoped the Minister would bear in mind that there was a large body of Conservative opinion in favour of retaining the nationalized network whatever it was called.

This plea received a further strengthening when Mr. George Strauss moved the official Opposition amendment deploring the estimated capital loss of £20 million likely to result from present and proposed policies. Although this motion was defeated by 303 votes to 249 Labour Members treated the Minister's winding-up statement that the Government were "considering the position" of the trunk services as a qualified victory for them. Mr. Boyd-Carpenter said he hoped to make a firm statement before the House rose for the summer recess.

Monopolies Commission Report

The debate of the week, of course, has been that on the report of the Monopolies Commission. There had been much newspaper and lobby speculation on just how far the Government intended to go on carrying out the proposal of the majority of the Commission that certain cherished business arrangements should be made a criminal offence. It seems that Mr. Thorneycroft intends to "make haste slowly." He hints at registration rather than prohibition as the Government's safest bet. One gathers that legislation may be introduced to compel the registration of a list of specified practices: private courts, collective stop lists, aggregated rebates and all the other variations frowned on by the Commission. A special tribunal might then be empowered to issue injunctions ordering companies and individuals to give up their alleged malpractices.

Most of the Opposition favour outright prohibition; I predict a lot more Parliamentary time will be given to the subject in both the general and the particular sense.

I.E.E. Elections

New President, Council Members and Section Officers

SIR GEORGE NELSON, Bt., F.C.G.I., M.I.Mech.E., M.I.E.E., chairman and managing director of the English Electric group of companies, and one of the leaders of the electrical manufacturing industry, has been elected President of the Institution of Electrical Engineers for the ensuing year.

Sir George was educated at the City and Guilds College, London, where he gained a Mitchell Exhibition, a Brush studentship, and a diploma in electrical engineering. He obtained his works training with the Brush Electrical Engineering Co., Ltd., and became chief outside engineer of the company. In 1911 he joined the British Westinghouse Co. (now the Metropolitan-Vickers Electrical Co., Ltd.), and in 1915 he became superintendent of the electrical machine and motor departments, five years later being appointed manager of the company's Sheffield works. He was appointed managing director of the English Electric Co., Ltd., in 1930, and in addition became chairman in 1933. He has travelled extensively on the Continent and in the United States and Canada, and has been responsible for, or associated with, the production of plant of some of the most important steam and hydro-electric power station installations and railway electrification schemes in the world. In March, 1942, he was chairman of the United Kingdom Tank Mission to the United States and Canada.

Sir George Nelson, Bt.

He has served on numerous public bodies, among which may be mentioned the Federation of British Industries, of which he was president from 1943 to 1945, the B.E.A.M.A. (president 1950), Advisory Council, Board of Trade (member), and the Census of Production Committee (chairman 1945). His paper on "Works Production," read before the I.E.E. in 1923, has been, and still is at the present time, the basis of many works organizations. He is a governor of the Imperial College of Science and Technology.

Sir George was knighted in 1943 for services to the Ministries of Aircraft Production and Supply, and had a baronetcy conferred on him in this year's Birthday Honours.

To fill the vacancies of vice-presidents, Mr. T. E. Goldup, C.B.E. (director, Mullard, Ltd.), and Sir Hamish D. MacLaren, K.B.E., C.B., D.F.C., LL.D., B.Sc. (Director of Electrical Engineering, Admiralty) have been elected. Viscount Falmouth (member of the S.E.E.B.) has been elected hon. treasurer.

New Council Members

The vacancies on the Council have been filled as follows:—Professor H. E. M. Barlow, B.Sc.(Eng.), Ph.D. (Science), M.I.Mech.E. (Pender Professor of Electrical Engineering, University College, London), Mr. C. M. Cock, M.I.Mech.E., A.M.I.E.Aust., M.I.Loco.E. (general manager, Traction Department, English Electric Co., Ltd.), Professor J. Greig, M.Sc., Ph.D. (William Siemens Professor of Electrical Engineering, King's College, London), and Mr. H. H. Mullens, B.Sc. (managing director, A. Reyrolle & Co., Ltd.). Associate members: Mr. D. McDonald (chief transformer designer, Bruce Peebles & Co., Ltd.), and Mr. D. B. Welbourn (lecturer at Cambridge University). Companion: Mr. G. L. Wates, J.P. (chairman and joint managing director, Johnson & Phillips, Ltd.).

The Council has co-opted Mr. C. T. Melling, C.B.E., M.Sc.Tech. (chairman, Eastern Electricity Board) to fill the vacancy created by the election of Sir Hamish MacLaren as a vice-president before the completion of his term of office as an ordinary member of the Council.

The new officers and committee members of the various Sections are as follows:—

Measurement and Control:—Chairman, Mr. W. Bamford, B.Sc.; vice-chairman, Mr. H. S. Petch, B.Sc.(Eng.); members, Messrs. J. Bell, M.Sc., J. K. Webb, M.Sc.(Eng.), B.Sc.Tech., and D. Edmundson, B.Sc.(Eng.).

Radio and Telecommunication:—Chairman, Mr. H. Stanesby; vice-chairman, Mr. H. S. McPetrie, Ph.D., D.Sc.; members, Messrs. F. S. Barton, C.B.E., M.A., B.Sc., T. B. D. Terroni, B.Sc., A. J. Biggs, Ph.D., B.Sc., F. Williams, B.Sc., and W. Ross, M.A.

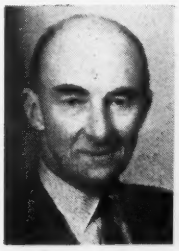
Supply:—Chairman, Mr. L. Drucquer; vice-chairmen, Mr. P. J. Ryle, B.Sc.(Eng.), and Mr. D. P. Sayers, B.Sc.; members, Messrs. J. A. Broughall, B.Sc., O. J. Crompton, M.Eng., and Mr. C. P. Holder, B.A.

Utilization:—Chairman, Mr. D. B. Hogg, M.B.E., T.D.; vice-chairman, Mr. J. Vaughan Harries; members, Messrs. R. H. M. Barkham, B.Sc.(Eng.), T. E. Houghton, M.Eng., J. M. Ferguson, B.Sc.(Eng.), and H. G. Taylor, D.Sc.(Eng.).

Mr. T. E. Goldup

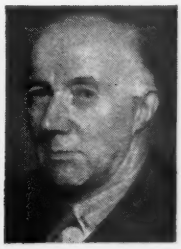
Sir Hamish MacLaren

Viscount Falmouth



Mr. C. M. Cock

Mr. H. H. Mullens



Mr. G. L. Wates

LETTERS TO THE EDITOR

Letters should bear the writers' names and addresses, not necessarily for publication. Responsibility cannot be accepted for the opinions expressed by correspondents.

Modern Meter Testing

I SHOULD like to comment briefly and seriously on Mr. Petch's lighthearted reply to my letters. Mr. Petch is wrong in thinking that I believe in tests by long-period dial runs only. The E.S.(M.)A. regulations prescribe such a method and also a method of mixed testing by disc and dial. Mr. Petch, as a meter engineer of some standing, may well be convinced as to the accuracy of a test by disc only, but he is aware that present regulations demand that at least one dial test *must* be included in certification tests.

Mr. Roscoe's contribution bears out the experience of most meter engineers, that mechanical testing of dials by manufacturers is only too fallible. In spite of Mr. Petch's modification of his sentence on low load testing, it still implies that the low load test covers only one-third of a revolution of the disc.

Mr. Petch must not imagine that I have been unaware of the stroboscope/counter method, as some years ago the equipment designed by Ferranti, Ltd., for this purpose was described by Mr. S. Wrigley in an article entitled, "A Rapid Method of Calibrating Single-Phase Meters." Nor have I been unaware of the stroboscopic and related pioneer work of Blathy and Moore over 30 years ago and of others since. I am not condemning stroboscope/counter testing, but would insist that all meters must be tested by a method in which the emphasis is on accuracy rather than speed of output.

Monkseaton. C. H. FORSTER.

Electric Vehicles

I HAVE just seen a note on the closing session of the British Electrical Power Convention during which it is stated to have been suggested that electric vehicles are not truly competitive with petrol vehicles and that the latter have a much longer life and require less maintenance.

Such a statement might very conceivably do great harm to the considerable efforts which are being made by the electric vehicle industry to encourage the use of electricity during off-peak periods and it is indeed most disappointing to some of us that greater use is not made of electric vehicles by Electricity Boards in such applications as meter service, cooker delivery and tower wagons, for which this type of transport in urban areas has proved itself to be eminently suitable.

There is, of course, no difficulty in proving that both in regard to long life and maintenance "electrics" show considerable savings over petrol vehicles; indeed detailed comparative figures have been published by the Electric Vehicle Association and also by the individual makers.

As one who has been associated with the electric vehicle industry throughout his working life, I can say quite categorically that the ten to fifteen years' life usually assumed in average annual running cost comparisons has always proved to be a considerable understatement because it is extremely rare for an electric vehicle to be scrapped in less than twenty years. A leading London store replaced its "electrics" after they had been continuously on the road for thirty years and the replacement was made only because of the obsolescence of the vehicles as far as appearance was concerned—mechanically and electrically they were still in first-class condition.

In the same report it was suggested that the use of electric vehicles was also limited because of their low pay-load capacity. It must be pointed out here that this again is incorrect since a considerable proportion of vehicles now being produced are of 30-cwt and 2-ton capacity. Vehicles of much greater capacity can be produced within speed and range limits—indeed such vehicles are already in use in connection with public cleansing.

While admitting that the majority of electric vehicles are used for milk and bread delivery, there has been, during the last few years, an increasing demand for them for use for parcels and coal delivery, in hospital grounds, for mobile shops, etc. H. W. HEYMAN,

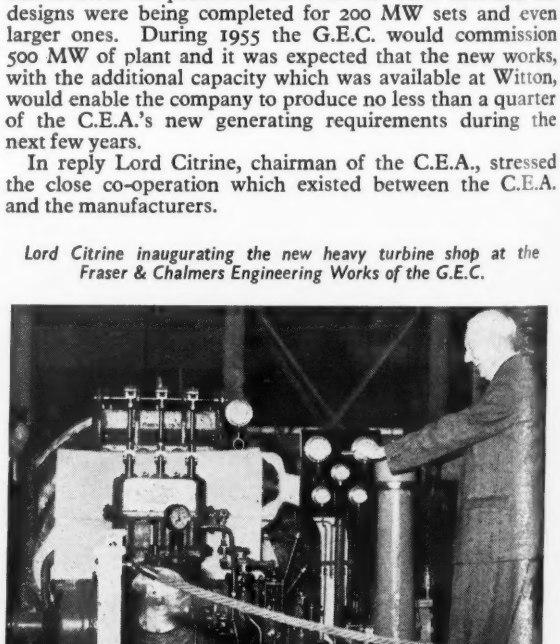
London, W.C.2. *Chairman,*
Electric Vehicle Association of Great Britain.

Steam Turbine Production

At the inaugural luncheon, after the opening of the new heavy turbine shop of the Fraser & Chalmers Engineering Works (see page 149), the toast "Our Guests" was proposed by Sir Harry Railing, chairman and joint managing director of the General Electric Co., Ltd. After outlining the history of Fraser & Chalmers, he said that the works had in hand the production of some 120 MW sets and the designs were being completed for 200 MW sets and even larger ones. During 1955 the G.E.C. would commission 500 MW of plant and it was expected that the new works, with the additional capacity which was available at Witton, would enable the company to produce no less than a quarter of the C.E.A.'s new generating requirements during the next few years.

In reply Lord Citrine, chairman of the C.E.A., stressed the close co-operation which existed between the C.E.A. and the manufacturers.

Lord Citrine inaugurating the new heavy turbine shop at the Fraser & Chalmers Engineering Works of the G.E.C.



VIEWS on the NEWS

By REFLECTOR

ONCE almost any proposal to establish a power station in a neighbourhood was certain to meet with determined opposition. Now, however, local interests appear to be vying with one another to secure the establishment of an atomic power station in their areas. Durham miners have put forward their case, Ulster has its claims and in the House of Commons last week Mr. Patrick Maitland, the Member for Lanark was "disappointed" that his suggestion that one should be established in the Carluke, Forth and Carstairs region had not so far been accepted. Even orthodox generating stations now have their friends. Recalling that at the end of the war Poole Harbour was being run at a loss, the *Poole and Dorset Herald* says that trade has now reached unprecedented levels and the Harbour Commissioners "are in no doubt about the main reason for Poole's prosperity—the Central Electricity Authority's power station at Hamworthy." As a result the Commissioners have been able to make a substantial cut in harbour dues.

* * *

In answering Mr. G. Nabarro's strictures on the North Wales hydro-electric schemes the Parliamentary Secretary to the Ministry of Fuel and Power, Mr. L. W. Joynson-Hicks, pointed out the fallacy of the basis of computation used, but in the reports which I have read there was no reply to the scathing reference to the North of Scotland Hydro-Electric Board's Loch Sloy scheme. This Mr. Nabarro described as the "biggest white elephant of any water works in the world." As I expected, this sweeping statement was not allowed to go unchallenged and at a Press conference in Edinburgh Mr. Thomas Lawrie, general manager of the Board, said that if it was the biggest white elephant "it certainly pulls a fine big load." The Highlands and the Board would be only too delighted to have more white elephants like it as pets. He went on to say that not only did the Loch Sloy scheme supply about 200,000 h.p. of peak load to Glasgow and industrial Clydeside when needed, but it did so in an economical way. The power was sold to the South of Scotland Electricity Board at a fair steam generating price and the North of Scotland Board's annual profit on the transaction was about £200,000. That surely should be convincing enough, to Scotsmen at any rate.

* * *

When the merits of gas and electricity for cooking are being discussed I have frequently heard supporters of the former assert "But housewives prefer gas for cooking," obviously feeling that they have clinched the argument. Like all generalizations it is difficult to refute, and it is worth while making a note of evidence to the contrary—of which there are many instances. Recently, for example, the Mexborough Urban District Council sent questionnaires to the 978 applicants on its waiting list for Council houses. The questions asked were principally of a personal nature, but at the bottom was included a note to the effect that "All new houses built by the Council are provided with a solid fuel cooking range. In the event of an additional source of power for cooking being fitted, state whether you would prefer gas or electricity." An analysis of the returns showed that 536 favoured electricity, 219 gas and 223 expressed no preference. The Council interpreted this as being 22 per cent only in favour of gas, and decided that this was not sufficient to justify the provision of gas supplies in new Council houses. It therefore decided that in future only electricity would be installed. I am told that the East Midland Gas Board's reaction has been to advise the Council that it will, nevertheless, continue to lay gas mains on future Council housing estates and I confess that I admire its tenacity.

* * *

Death rays have popped up again. The *Manchester Guardian* reports the sad case of a man in Bangalore, India, who accuses the British Government of focusing supersonic waves upon him from their base in Great Britain with apparatus lent by the American Government. As a result of this treatment his various organs have been deranged and he appeals to people everywhere to make a protest of their own. He says:—

> "We hope that by your prompt and immediate action not only the life of Mr. Nandakumar Narshi Anjaria, but also of those who are suffering by this focusing in India, will be saved."

I am sorry to hear that the Indian Government, to whose attention the matter has been drawn, does not appear to take it seriously.

* * *

Besides the start of a lengthy High Court action over an Edison telephone patent (United Telephone Co., Ltd. *v.* Bassano & Slater) the *Electrical Review* of 18th July, 1885, contained an interesting report on early discussions on electric street lighting in the City of London. This seems, oddly, to have been one of the duties of the Commissioners of Sewers. At their fortnightly meeting it was moved that, "having regard to the repeated failures of private companies," the Commission should undertake street lighting by electricity. The report goes on to say:—

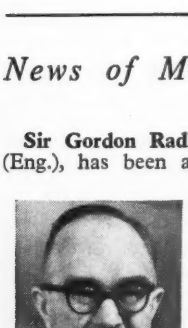
> "Mr. Deputy Bedford regarded it as an extremely mild form of resolution. He invited members to go to theatres and large establishments where the electric light was in use. The present lighting of the City cost less than a penny in the pound, and they had an offer from a gentleman who lighted Holborn Viaduct to give double the light for a contemptible increase of £130,000 a year. They were so economical on the question of lighting, and so extravagant on other matters that they refused to accept that offer."

His views were not shared by all the members, and one referred to the expense of electric lighting at the Savoy which, he said, "would stagger those who talked about its being used for purposes of ordinary lighting." However, it was agreed to experiment with the new form of street lighting.

PERSONAL AND SOCIAL

News of Men and Women of the Industry

Sir Gordon Radley, C.B.E., Ph.D. (Eng.), has been appointed Director General of the Post Office in succession to **Sir Alexander Little,** K.C.B., who is retiring on 30th September next. **Mr. R. J. P. Harvey,** C.B., and **Mr. S. D. Sargent,** C.B., are appointed Deputy Directors General of the Post Office in succession to Sir Gordon Radley and **Sir Dudley Lumley,** K.B.E., C.B., who is retiring on 31st August next.

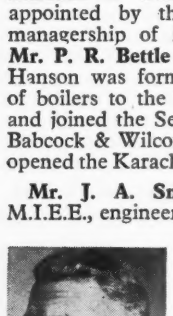


Sir Gordon Radley

Sir Gordon is the first engineer to become Director General of the Post Office. He joined the Post Office Engineering Department in 1920. From 1944 to 1949 he was Controller of Research, and from 1949 to 1951 Deputy Engineer-in-Chief, being appointed Engineer-in-Chief in the last mentioned year. He has been Deputy Director General since September last year.

Mr. A. W. Hanson, until recently manager of the Karachi office of Babcock & Wilcox, Ltd., has been appointed by the company to the managership of its Newcastle office. **Mr. P. R. Bettle** is his deputy. Mr. Hanson was formerly chief inspector of boilers to the Burma Government, and joined the Service Department of Babcock & Wilcox, Ltd., in 1946. He opened the Karachi office in 1949.

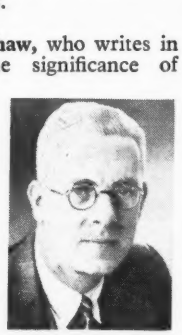
Mr. J. A. Smale, C.B.E., B.Sc., M.I.E.E., engineer-in-chief of Cable & Wireless, Ltd., has been appointed by the Government of Cyprus to be first chairman of the new Cyprus Inland Telecommunications Authority. The appointment is a part-time one, and Mr. Smale will continue to serve Cable & Wireless, Ltd., in his present post, visiting Cyprus as necessary. The new Authority was set up to administer and operate Cyprus' inland telephone and telegraph systems. It took over from Cable & Wireless, Ltd., on 1st January last. Most of the company's staff in Cyprus hitherto engaged on the work will be transferred to the Authority. Cable & Wireless, Ltd., continue to be responsible for the island's external telecommunications.



Mr. J. A. Smale

Mr. Smale has been engineer-in-chief of Cable & Wireless, Ltd., since 1948, and in that capacity during recent years directed the conversion in the main towns of the Cyprus inland telephone system to automatic working. He joined Cable & Wireless, Ltd., in 1929, after ten years with Marconi's Wireless Telegraph Co., Ltd. He was appointed assistant engineer-in-chief in 1934, and was engaged in the development of long distance radio communications. He was awarded the C.B.E. in 1953 and in the same year was chairman of the Radio Section of the Institution of Electrical Engineers.

Mr. C. J. Crawshaw, who writes in this issue on the significance of power station thermal efficiency, entered the electricity supply industry in 1923 when he started as a student engineer with the Newcastle-upon-Tyne Electric Supply Co., Ltd. At the conclusion of a three - year course he became a technical assistant in the Steam Testing Department of the company. In November, 1949, following nationalization, he was appointed to his present position of plant testing and efficiency engineer with the Eastern Division of the British (now Central) Electricity Authority.



Mr. C. J. Crawshaw

Mr. B. B. Green, M.C., and **Mr. W. J. McBride,** A.M.I.Mech.E., have been appointed to the board of Edgar Allen & Co., Ltd.

Following the retirement of **Mr. H. R. London** and **Mr. W. W. Brown,** the London Division of the Central Electricity Authority has appointed **Mr. M. G. Crockett,** M.Inst.F., as superintendent at the St. Marylebone generating station, and **Mr. C. E. Sheppard,** A.M.I.E.E., superintendent at the Bow generating station.

After early experience in the mining industry, Mr. Crockett went to St. Marylebone in 1924 where he has remained through successive stages of promotion.

Mr. Sheppard commenced with the Metropolitan Electric Supply Co. in 1924 and transferred to the London Power Co. at Acton Lane in 1935. Since vesting date he has held positions at Deptford East and Fulham and was appointed deputy superintendent at Bow in 1952.

Mr. F. R. R. Jones, B.Sc.(Eng.)Hons., A.M.I.Mech.E., A.M.I.E.E., has been appointed deputy superintendent at the Deptford West generating station. Mr. Jones entered the supply industry in 1948 and has held several positions at the Deptford East and West stations.

At present superintendent at the Blackwall Point generating station, **Mr. A. G. Cox,** Associate I.E.E., A.M.Inst.F., is taking up the appointment of superintendent of the Bankside "A" and "B" generating stations on 1st August next. He was with the Folkestone Electric Supply Co., Ltd., from 1920 to 1946 when he joined the County of London Electric Supply Co., Ltd., at Barking. He was appointed superintendent at the new Blackwall Point station in 1951.

Mr. J. Y. Dick, of Oliver Melville & Co., Kirkcaldy, has been appointed to represent the Electrical Contractors' Association of Scotland on the Electrical Fair Trading Council in succession to **Mr. D. G. Lindsay,** A.M.I.E.E.

Mr. C. H. E. Ridpath, B.Sc., M.I.E.E., A.M.I.Mech.E., chief electrical engineer of the Aluminium Wire & Cable Co., Ltd., since its formation, has now been appointed consulting electrical engineer to the company. He will continue to act in this capacity after the normal date of his retirement next April, having completed more than forty-two years of continuous service in the aluminium industry.

Mr. C. H. E. Ridpath

Mr. W. J. Nicholls, B.Sc., A.C.G.I., M.I.C.E., M.I.E.E., who has been appointed to succeed Mr. Ridpath as chief electrical engineer, has had long and extensive experience of overhead transmission engineering. He was with the Foundation Co., Ltd., until 1929, when he joined Kennedy & Donkin, consulting engineers, and supervised construction of the 132 kV grid. He joined the Central Electricity Board, later the Central Electricity Authority, and specialized in the design of overhead transmission lines. He entered the service of the

Aluminium Wire & Cable Co., Ltd., in 1950.

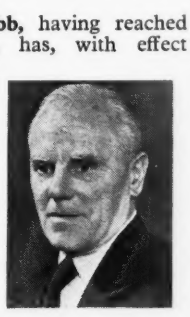
Mr. C. A. Baker, A.M.I.E.E., who has been in charge of the electrical control gear side of William Geipel, Ltd., Bermondsey, S.E.1, since 1946, has been appointed a service director of the company.

At a farewell gathering on 15th July **Mr. A. Franklin,** Rugby district commercial engineer for the East Midlands Electricity Board, was presented by his colleagues with an electric water heater to mark his retirement after thirty-six years' service, and his wife was presented with a bouquet. Mr. Franklin's successor is **Mr. D. V. Weston,** his former chief assistant at Rugby.

Mr. H. H. Hatton has been appointed assistant manager of the Liverpool branch of the General Electric Co., Ltd. Mr. Hatton was educated at King Edward VI School, Stratford-on-Avon, and joined the G.E.C. in 1933 as a student apprentice at the company's Witton Engineering Works. Subsequently he was appointed to the Engineering Estimating Department and Export Sales Department at Witton. In 1939 he joined the Manchester branch, Engineering Department and, except for a short period of military service, was chiefly engaged on Admiralty contract work throughout the war. In 1946 he was appointed to the Industrial Sales Department, and in 1950 became manager of the Industrial Sales Department at the Liverpool branch.

Mr. H. H. Hatton

Mr. F. G. Robb, having reached the retiring age, has, with effect from 3rd June, relinquished his position as chief of the test division of Marconi's Wireless Telegraph Co., Ltd. He is succeeded by **Mr. E. H. Evans.**



Mr. E. H. Evans

Mr. Robb served with Marconi's for thirty-six years, first in the company's test division, and later moving on to designs and to development. He worked on beam transmitters during the development of the Marconi-Franklin short-wave beam system which links the countries of the Commonwealth. He was one of the team engaged in the design of the prototype 100 kW short-wave transmitter for the B.B.C., and later this same team was responsible for the design of much of the transmitting equipment at Alexandra Palace. During the last war he was seconded to the Admiralty and became chief of Admiralty radar test. He was appointed chief of Marconi's test division in 1948.

Mr. Evans joined Marconi's in 1913. He has been associated with the test division throughout his service, and for a number of years had been chief of receiver test.

Mr. R. E. Burnett, M.A.(Oxon.), A.M.I.E.E., A.Inst.P., who has been assistant to the general manager for special duties, as well as manager of education and technical personnel and principal of Marconi College, has now been appointed full-time assistant to the general manager. His duties as manager of education and technical personnel will be undertaken by **Mr. E. R. L. Lewis,** M.A., A.M.I.E.E., who has for some time been acting as his deputy. **Mr. R. G. Hulse,** B.Sc.(Hons.), who has been deputy principal of Marconi College during the same period, has now been appointed principal of the College.

Mr. J. S. Dumeresque, A.M.I.E.E., has been appointed general manager of Semtex, Ltd., the Dunlop subsidiary. Mr. Dumeresque received his training as an electrical engineer at Faraday House. After two years with the Sunbeam Motor Co. and Ferranti, Ltd., he was appointed an assistant to the late Sir Henry Royce, of Royce, Ltd. In 1929 he went to India as operating manager of the Western Electric Co. and in 1936 he opened up broadcasting in Malaya as general manager and chief engineer of the British Malaya Broadcasting Corporation; when the Government took over broadcasting early in the war he became the first director of the Department of Broadcasting in Malaya. During the war he served with the Political Intelligence Department of the British Embassy in Washington and as a colonel on the staff of Lord Louis Mountbatten in Ceylon and Malaya. He joined the Dunlop Rubber Co. after retirement from the Colonial Service and has recently been in India, returning to England in May this year.

The South Eastern Area final of the **Electrical Industries National Golf Championship** took place on 8th July at Effingham Golf Club. The winner was Mr. F. W. Shaw and the runner-up Mr. V. J. Moore. The best scratch score was returned by Mr. W. G. Hulks. This year the winner received the Sir John Dalton trophy, the runner-up the Sir Henry Self Cup and the best scratch the Seeboard trophy. These area winners will go forward to the National Final to be held at Sutton Coldfield on 26th September. In the afternoon an open competition (Stableford scoring) was held, prizes for which were the Allen West silver salver for the winner; a tankard for the runner-up; and the William McFadzean rosebowl for the best scratch score. These were won by the following:—First: Mr. A. R. Rye. Runner-up: Mr. H. Davies. Best scratch score: N. Mockett.

The results of the Southern Area Golf Championship meeting held at High Post Golf Club, near Salisbury, on 6th July are as follows:—First, handicap and winner of the Allen West challenge cup: Mr. J. Holton. Second: Mr. W. R. White. Scratch score and winner of scratch prize: Mr. L. G. Chittenden.

Following the death of Mr. J. J. Conlan, the British Electrical and Allied Manufacturers' Association has appointed **Mr. A. W. Bailey** head of the Statistical Department and **Mr. R. F. Masters** editor of the *BEAMA Journal.* Mr. Bailey, who is an economics graduate of London University, has been a member of the Statistical Department since 1946. Mr. Masters has been Mr. Conlan's assistant on the *Journal* since 1950 and was previously with Marconi's Wireless Telegraph Co., Ltd., and Standard Telephones & Cables, Ltd.

Wm. Sanders & Co. (Wednesbury), Ltd., announce the appointment of **Mr. A. M. Canto** as their sales manager. Apprenticed to Higgs Motors, Ltd., Mr. Canto joined first the Metropolitan-Vickers Electrical Co., Ltd., and later George Ellison, Ltd., with whom he was associated for many years before joining Westool, Ltd., which company he now leaves to take up his new appointment.

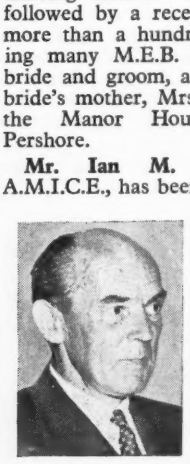
Mr. A. M. Canto

Mr. William Winwood, manager of the Shropshire and Herefordshire Sub-Area of the Midlands Electricity Board, was married at Wick, near Pershore, Worcs, on 16th July to **Miss Barbara Evans,** until recently housecraft adviser in charge of the M.E.B. service training centre at Aston Fields, Bromsgrove, Worcs. The couple met

Mr. and Mrs. W. Winwood after their marriage at Wick

three years ago when Mr. Winwood paid a business visit to the service training centre. The wedding was followed by a reception attended by more than a hundred guests, including many M.E.B. colleagues of the bride and groom, at the home of the bride's mother, Mrs. Helen Evans, of the Manor House, Wick, near Pershore.

Mr. Ian M. Mackay, B.Sc., A.M.I.C.E., has been promoted by the South Eastern Electricity Board from assistant commercial engineer to fill the post of deputy chief commercial officer. Mr. Mackay was born in Edinburgh and graduated at the University there. After some years in civil and railway engineering, including a visit to South America, he spent five years on the teaching staff at Leeds University, specializing in agricultural engineering. In 1936 he was appointed to the sales staff of the Yorkshire Electric Power Co., and just before the war he was made a district manager. Among the first staff appointed by Seeboard when setting up its headquarters at Hove, Mr. Mackay has been primarily concerned with tariffs, hire and hire purchase and agricultural development. He serves on committees of the British Electrical Development Association and Electrical Research Association dealing with rural electrification.



Mr. I. M. Mackay

Mr. W. W. Duff, A.A.C.C.A., A.C.I.S., has been appointed deputy chief accountant to the Uganda Electricity Board.

Mr. H. W. Heyman, managing director of Smith's Delivery Vehicles, Ltd., has joined the board of Hotel-Plan, Ltd., Zurich.

Mr. C. L. Fisher has been appointed to the board of the Consolidated Pneumatic Tool Co., Ltd. He has been manager of the British Sales Division since 1951 and has been with the company for about forty-two years.

On 2nd July the championship sports of the **General Electric Co., Ltd.,** were held at the Magnet Club Grounds of the Witton Works. For the competitors sunshine and a fresh breeze provided ideal conditions. Throughout the afternoon music was provided by the Royal Artillery (Plymouth) Band, and during a short break in the sporting events, the Bouncing Dillions entertained the crowd with their trampoline act. Sideshows, a fancy dress competition and other non-sporting events played their part in a most successful sports meeting. In the championship events the holders retained the cups with only two exceptions. Birmingham succeeded in wresting the Harold Hirst Cup from London, only to find that honours were evened by London winning the Hon. Mrs. Leslie Gamage Cup. Of the Witton challenge cups two of the five changed hands. Castle Bromwich Hall won the directors' cup by defeating the Switchworks and A. Cole now holds the Leslie Gamage Jubilee Cup by winning the fire brigade one man drill.

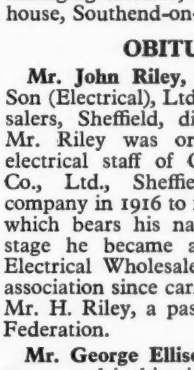
At the close of the meeting the challenge cups and prizes were presented to successful competitors by Mrs. J. J. Gracie, wife of the director at Witton.

Seven employees of **E. K. Cole, Ltd.,** recently received long-service awards (gold watches) to mark the completion of twenty-five years' service with the company. The presentations were made by Mr. E. K. Cole, chairman and managing director, in the Ekco Clubhouse, Southend-on-Sea.

OBITUARY

Mr. John Riley, of John Riley & Son (Electrical), Ltd., electrical wholesalers, Sheffield, died on 12th July. Mr. Riley was originally with the electrical staff of Cammell Laird & Co., Ltd., Sheffield, leaving that company in 1916 to found the business which bears his name. At an early stage he became a member of the Electrical Wholesalers Federation, an association since carried on by his son, Mr. H. Riley, a past-president of the Federation.

Mr. George Ellison.—The death is announced in his eighty-third year, at Rheinfelden, near Basle, Switzerland, of Mr. George Ellison, chairman of the switchgear works of George Ellison, Ltd., of Tufnol, Ltd., and of the iron foundry of Alfred Ellison, Ltd. He was educated at Manchester Grammar School and after serving an apprenticeship with the Oerlikon Co., in Switzerland, followed a course of study at Winterthur University. In 1893 he went to America and worked with the Westinghouse Co., as designer and chief draughtsman and also with the Western Electric Co., in Pittsburgh, New York and Chicago. Returning to Europe in 1898, he started business in Paris to make and sell electric switchgear. The business in Paris grew rapidly and Mr. Ellison was not undeservedly styled the "father of the French switchgear industry." In 1906 the business was transferred to Birmingham, where it quickly outgrew its accommodation and in 1916 the original buildings of the present factory were built at Perry Barr. In 1929 Mr. Ellison founded Tufnol, Ltd., under its former name of Ellison Insulations, Ltd., and in 1946 the foundry of Alfred Ellison, Ltd., was brought into the Ellison group of companies.



The late Mr. George Ellison

Mr. Ellison took a life-long interest in industrial welfare. He was a life governor of the University of Birmingham and a benefactor to the Queen Elizabeth Hospital, Birmingham. The interment took place at Interlaken last Wednesday.

Mr. R. Charles.—The death occurred on 8th July, at the age of sixty-nine, of Mr. Robert Charles, until 1949 manager of the Leeds depot of the Simplex Electric Co., Ltd. He joined Credenda Conduits, Ltd., in 1924, the company being merged with the Simplex Electric Co. in 1932. He continued to assist the company in a consultative capacity after his retirement.

Sir Richard W. Allen, C.B.E., D.L., the well-known marine engineer, and chairman of W. H. Allen, Sons & Co., Ltd., Bedford, died on 17th July at the age of eighty-eight. Sir Richard was the eldest son of the late Mr. William Henry Allen, who founded the firm of W. H. Allen & Co. He was educated at Christ College, Finchley, and received his technical education privately under Dr. Gisbert Kapp. He served his apprenticeship with his father's firm at the original works in Lambeth, London, which was then engaged in the manufacture of centrifugal pumps. In 1894 the business was transferred to Bedford, and in the same year the founder took his son Richard into partnership and the firm became W. H. Allen, Son & Co., being restyled W. H. Allen, Son & Co., Ltd., in 1900 and in 1920, W. H. Allen, Sons & Co., Ltd. For a period of thirty-two years after the move to Bedford, Sir Richard was managing director, and he became chairman after his father's death in 1926.

Sir Richard travelled extensively, and one of his round the world trips was as a British delegate for the University of Cambridge, the University of London and the Institution of Mechanical Engineers to represent these bodies at the World Engineering Congress held in Tokyo in 1929. He was a past-president, Section G of the British Association, a past-president of the Institution of Mechanical Engineers, a vice-president of the B.E.A.M.A., and a member of numerous other scientific and engineering societies, to which he contributed many papers on ships' auxiliary machinery and equipment.

Mr. E. E. Hoadley.—Arrangements have been made by the Institution of Electrical Engineers, in co-operation with other bodies in the electrical industry, for a memorial service to the late Mr. E. E. Hoadley, C.B.E., M.I.E.E., to be held at the Queen's Chapel of the Savoy, Savoy Street, London, W.C.2, at 11.45 a.m. on Wednesday next. It will be conducted by the Rev. C. L. Cresswell, C.V.O., M.A., F.S.A.

INDUSTRIAL NEWS

Electrical Installation for Iraq Parliament

James Kilpatrick & Son, Ltd., Paisley, have secured the contract for the complete electrical services in the new Houses of Parliament at present being built on the banks of the Tigris in Baghdad. The contract, which is valued at some £200,000, has been secured against keen competition, particularly from Continental firms. The installation, which is one of some complexity, includes, in addition to general lighting and power, some special electrical systems, particulars of which cannot yet be divulged. James Kilpatrick & Son are already engaged on the electrical services in the Royal Palace which is being built in Baghdad for King Faisel II as well as electrical installations in the new buildings for the Ottoman Bank and the British Bank of the Middle East, at present being constructed in Baghdad.

Vocational Course for Boys

A vocational course has been introduced by South Wales Switchgear, Ltd., Blackwood, Mon, for grammar school pupils in their fourth year, the object of which is to introduce the boys to engineering before completing their school education. The course is for two separate weeks at the company's works, the first being held during the current week and the second commencing on 15th August. On the closing day of the second week, educational and industrial authorities will attend. There will be a general discussion with the boys, and questions will be answered arising from their period at the works.

Telcon Metals Group

The Telegraph Construction & Maintenance Co., Ltd., announces the establishment of a Metals Group and the appointment of Mr. W. F. Randall, a director of Telcon, as managing director of the Group. The growing importance of Telcon's metals interests is reflected in the creation of the new Group which, in addition to the new 8½-acre Crawley metals factory, embraces Telcon-Magnetic Cores, Ltd., Chapelhall, Lanarkshire; Temco, Ltd., Lydbrook; Sankey-Telcon, Ltd., Crawley; and the recently acquired Magnetic & Electrical Alloys, Ltd., Burnbank, Hamilton.

Radio Equipment for Burma

An order worth more than £125,000 has been placed by the Government of Burma with Standard Telephones & Cables, Ltd., to equip a new overseas radio telephone and telegraph centre. New radio stations at Rangoon will provide Burma with a direct public radio telephone circuit to London, and radio telephone and telegraph circuits to Madras, India. The order includes DS.13 and DS.12 single-sideband transmitters of 40 kW and 4 kW respectively, RX9A single-sideband receivers, RX5B radio telegraph receivers, terminal and privacy equipment, teleprinters and highly efficient beam aerials.

Equipment for I.T.A. Links

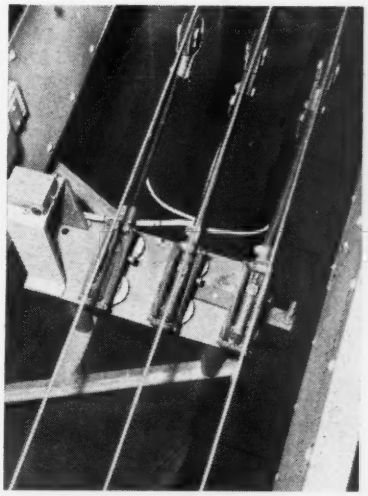
The General Electric Co., Ltd., is supplying the General Post Office with equipment for two new television links which will extend the coverage of the I.T.A. transmissions. The first of these is a microwave radio link between Birmingham and Lichfield, which will provide two channels from Birmingham to Lichfield and one channel in the reverse direction. The G.E.C. is providing all equipment for this link, which is similar to the links supplied by the G.E.C. over the Eurovision network. The second link is from Birmingham to Winter Hill, near Bolton. The G.E.C. is supplying all the line equipment needed for the transmission of I.T.A. signals over a coaxial cable link between these points.

Welding Plant Development

To cope with the rising demand for its products, Sciaky Electric Welding Machines, Ltd., Slough, has recently acquired additional floor space, which will increase the area by three times what it was at the beginning of this year. This acquisition is preparatory to tooling up for "automation." Production has commenced in the new premises and new machinery which is being installed will include paint spraying and metal finishing equipment. The electronics laboratory has been enlarged.

Hangar Door Operation

At the Ministry of Supply Establishment at Boscombe Down a weighbridge hangar has been specially built for the weighing and calibration of new types of aircraft. It has doors measuring 297ft in width and 67ft in height, second only in size to the Bristol Brabazon hangar doors. The hangar is fitted with doors at both ends, and each consists of two parts which can be operated to open either from the centre to the sides, or from the sides to the centre. The motive power for the movement of each door is supplied by four 5 h.p. 3-phase motors operating at 400 V a.c. Electricity is supplied to the motors through current collection equipment which has been manufactured by British Insulated Callender's Cables, Ltd. The current is picked up from three grooved copper trolley wires by miniature current collectors fitted with carbon insert slipper heads. The wires are approximately 300ft long and are supported at intervals of 34ft from insulated supports and 3½in mechanical ears. Porcelain insulation has been used throughout. The wires have been erected at a tension of 550 lb at 60 deg F and are fed with a.c. at one end by means of 0·0225 sq in v.r.i. cables. The doors were designed, manufactured and erected by Esavian, Ltd., of Stevenage, and the installation of the current collection equipment was carried out by British Insulated Callender's Construction Co., Ltd.



View looking down on current collectors and door limit switch for the weighbridge hangar at Boscombe Down

Neon Sign

A newly erected facia sign on the premises of Alice Edwards, Ltd., 54, Conduit Street, London, W.1, has attracted favourable comment. It is a new type of neon sign known as the "Lumina" by its makers, Franco Signs, Ltd. The faces of the letters are in white "Perpex" but the sides, or "returns," are of metal. The fluorescent tubing, which is illuminated in apple green, is mounted behind the "Perspex," creating not only a novel night effect, but also preserving the clean lines of the sign by day.

The Forming of Aluminium Sheet

Under the above title the Northern Aluminium Co., Ltd., has reprinted in book form a series of articles on the subject by one of their development engineers, Mr. H. Hinxman, which aroused much interest when they first appeared. In ten chapters, copiously illustrated, this 64-page book presents

in a readily applicable and essentially practical form the fundamental concepts of the use of the material. The subjects dealt with in its pages include the characteristics of the metal, and its manipulation in bending, spinning, deep drawing, pressing, drop-hammer forming, rubber-die pressing, stretch-forming, hand forming, blanking, piercing and various supplementary operations.

Motors for Tube Trains

The General Electric Co., Ltd., has received an order from the London Transport Executive for thirty-two 575 V traction motors to equip three prototype tube trains of steel construction with aluminium panelling, and incorporating rubber in the suspension. The motors will be generally similar to the LT100 design, of which the company has supplied 923 for London Transport tube stock, but will be slightly smaller and lighter. They will be self-ventilated four-pole machines with roller armature bearings and roller bearings in the axle-suspension sleeve. Transmission will be through Wiseman gears with a ratio of 18/65. Of the twenty-one vehicles in the prototype trains, fifteen will be motored, one motor being mounted in each bogie. The motors will have a 1 hr rating of approximately 115 h.p.

Agricultural Laboratory Instruments

Baird & Tatlock (London), Ltd., have received a contract valued at £20,000 for the supply of scientific instruments and apparatus for agricultural laboratories in Yugoslavia.

Lamp Shade Display Stand

A new lamp shade display unit which is available to stockists of "Rotaflex" and "Geni" products has been introduced by Rotaflex (Gt. Britain), Ltd., 90, Regency Street, London, S.W.1. The unit is in two sections and has been designed to occupy the minimum of floor space. The top tube is wired, all flexes being cut and fitted to correct lengths. The display stand is enamelled white, the boards being in natural varnished fireproof "Wayroc" material. The complete display unit is ready to be plugged into the mains supply.

Section 2 of the new "Rotaflex" display unit

Colliery Year Book

The 33rd edition of the "Colliery Year Book and Coal Trades Directory" presents in a convenient and reliable form the fullest information on the coal mining and allied industries. The data in the standard sections has again been thoroughly revised and the appointments recently made in the National Coal Board are included. In addition, new features have been introduced. There are details of the principal coal mines in the United States and there is a coal industry films guide, while considerable space has been given to the Mines and Quarries Act, 1954. Mr. W. E. Jones, president of the National Union of Mineworkers, contributes a foreword.

The Year Book is published by the Louis Cassier Co., Ltd., Dorset House, Stamford Street, London, S.E.1.

Kent Agricultural Show

"A Power of Help in the Farm and Home" was the theme of the South Eastern Electricity Board's display at the Kent Agricultural Show at Maidstone last week. A central feature symbolizing agriculture, horticulture and the home was personified by life-sized figures of maidens partially clad in leaves. Around this were various displays dealing with individual services.

"The Four Foundations of Modern Living"—cooking, water heating, laundry and refrigeration—were represented and, in conjunction with the manufacturers, demonstrations were given of automatic cooking, cold cookery, laundry work, and home cleaning, particular attention being drawn to the Ferranti "Fridge-Heater." Round the main demonstration room, which accommodated a hundred people, were small three-dimensional displays, showing various pieces of domestic apparatus.

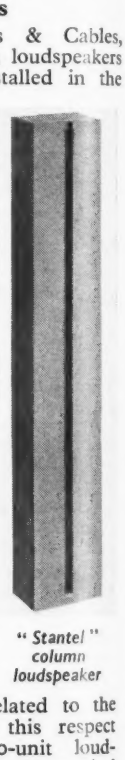
Milking, milk cooling, sterilizing, water heating, combined grain and grass drying, food preparation and storage, pig food cooking, soil heating and sterilizing, plant irradiation, hedge trimming and mechanical handling were among the farming processes covered. Apart from the stand itself being illuminated by fluorescent tubes, there was a special display of typical farm lighting equipment. The exhibit was designed and erected by the Board's own staff.

Light Railway Across Road

An inquiry is to be held on 27th July at Newcastle-on-Tyne by the Ministry of Transport and Civil Aviation into an application by C. A. Parsons & Co., Ltd., for permission to construct a light railway over Shields Road, Newcastle. The railway is needed in connection with a large scheme, planned by Parsons in association with several other firms, for the building of a factory for the making of nuclear energy plants.

Column Loudspeakers

Standard Telephones & Cables, Ltd., "Stantel" column loudspeakers have recently been installed in the Royal Festival Hall and in the Egyptian Hall of the Mansion House in London and represent an advance in the technique of sound radiation within enclosed auditoria. Correctly placed, the new "Stantel" loudspeaker is claimed to have directional properties which keep radiation away from the roof areas and, within the wide angle of horizontal radiation, afford a high-power high-quality sound source which is ideal for speech or music. It may also be used in highly reverberant auditoria where conventional loudspeakers would produce prolonged sound reflections.



"Stantel" column loudspeaker

The directivity in the vertical plane is related to the column height and in this respect the height of the 10-unit loudspeaker array provides ample vertical directivity for most auditoria. The device is prevented, by the slot diffusers, from becoming too directional at the higher frequencies. The diffusers ensure a substantially uniform distribution of all radiated frequencies over a horizontal angle of 150 deg and by reducing high-frequency focusing, give a smoother distribution in the vertical plane.

Signalling Improvements

British Railways (London Midland Region) have begun work on a £275,000 scheme for a new signal box and colour light signalling, power operated points and track circuiting of St. Pancras station and its approaches. This will mean speedier train operation into and out of the station, particularly at times of bad visibility. The work

will be carried out in two stages and will take about two and a half years to complete.

Power Cable Fatality

It is reported that John Birkett, an employee of the Midlands Electricity Board, was killed and seven other employees were injured at Brailes, near Banbury, last week while converting an 11 kV line from single-phase to 3-phase working. An official of the Board stated that the line had been disconnected and earthed. During the operation it became jammed and in being jerked free by the winch it sprang upwards and touched a 66 kV main transmission line.

Marking of Imported Wire Goods

The Board of Trade has been advised that imported wire goods should bear an indication of origin at the time of importation and when offered for sale. This recommendation is contained in the report of the Standing Committee set up under the Merchandise Marks Act, 1926, and published as Command No. 9528, price 4d (post free 5½d).

Monopolies Commission

In accordance with the provisions of the Monopolies and Restrictive Practices Commission Act, 1953, the chairman of the Commission has appointed the following group to consider and report on the Commission's reference concerning the supply of electronic valves and cathode ray tubes:—Sir David Cairns, Q.C. (chairman), Professor G. C. Allen, Mr. J. Archdale, Mr. W. G. Cullen, Mr. C. N. Gallie, Mr. C. H. P. Gifford, O.B.E., Professor A. L. Goodhart, K.B.E., Q.C., Mr. Gordon Stott, Q.C., and Mr. C. E. Wrangham, C.B.E. Written and oral evidence is now being taken from manufacturers, wholesalers, retailers and others interested in the trade. Any inquiries, and any offers to give evidence to the Commission, should be addressed to the Monopolies and Restrictive Practices Commission at 8, Cornwall Terrace, Regents Park, London, N.W.1.

Plant Engineers' Scottish Conference

The Incorporated Plant Engineers are holding a Scottish Regional Conference from 21st to 23rd October at the Dunblane Hydropathic, Perthshire. The morning sessions will be technical and there will be social events, including displays of Highland and Scottish country dancing, in the afternoons and evenings.

Waterwheel Alternators for Venezuela

Considerable interest was shown in a sectional model of a vertical waterwheel alternator which was recently flown to Venezuela by the British Thomson-Houston Co., Ltd., for demonstration purposes. The machine represented is one of four large generating units now being built by the B.T.H. Co. at Rugby and is rated 44,444 kVA, 0·9 p.f., 11 kV, 3-phase, 50 c/s. It is driven at 136·4 r.p.m. by a 56,000 h.p. Francis turbine. While the model was in Venezuela it was lent to Major R. A. Ravard, president of the Commission de Estudios Electrificacion del Caroni, to illustrate a lecture he gave at the College of Engineers in Caracas, on the scheme for the electrification of the Rio Caroni.

A section of the new showroom of Froylectric, Ltd., electrical wholesalers, Leamore Street, Hammersmith, London, W.6

Good Plastics Design

The MK plateswitch made by M.K. Electric, Ltd., was one of the exhibits selected from the whole field of plastics for a special display featuring good design at the recent British Plastics Exhibition. The independent panel of judges consisted of Mr. M. Black, O.B.E., F.S.I.A., president of the Society of Industrial Artists, Sir Francis Meynell, R.D.I., Master of the Faculty of the Royal Designers in Industry, and Sir Gordon Russell, C.B.E., M.C., R.D.I., director of the Council of Industrial Design.

Crypto Extension

To meet the need for extra space to cope with an ever-expanding business, Crypto, Ltd., one of the companies in the Lancashire Dynamo group, is rebuilding its works in the North Circular Road, London, N.W. This increase in accommodation is being undertaken in four phases so that it may be carried out without interference to production. The rebuilding will entail an expansion in works space, an additional office block and a new canteen. The first section of this work has now been completed and it is anticipated that the new works, giving a 50 per cent increase in floor space, will be fully operative in the spring of next year.

Works Visit

On 11th July Dr. Charles Hill, the Postmaster General, accompanied by Sir Gordon Radley, deputy director general of the Post Office, and Mr. A. W. C. Ryland, principal private secretary to the Postmaster General, visited the Ocean Works, Erith, of Submarine Cables, Ltd., and saw the first transatlantic telephone cables being made. Before the visit they were entertained to lunch at the Greenwich works of the Telegraph Construction & Maintenance Co., Ltd., where they were received by Mr. J. N. Dean, chairman and managing director of Submarine Cables, Ltd., and his co-directors. Whilst at Ocean Works Dr. Hill took the opportunity of going on board H.M.T.S. *Monarch*, which had arrived a few days earlier to commence loading deep-sea type cable for the main Atlantic span.

New House Journal

Petbow, Ltd., has sent us a copy of the first number of the "Petbow Magazine." In addition to items of "domestic" news, there is an article (with some excellent illustrations) on the history of the Cinque Port of Sandwich, where the company has its works, another on the gas turbine, presented in a manner easily grasped by the beginner, and an impression by a member of the Technical Service Department who attended the Baghdad Trade Fair, of his stay in Iraq.

Trade Announcements

Permanoid, Ltd., has opened a Midlands branch at 558, Wolverhampton Road East, Fighting Cocks, Wolverhampton (telephone: Wolverhampton 38367). This branch will cover the Birmingham and Midlands area and is under the management of Mr. D. J. Blashill.

From 1st August the London office of **James Kilpatrick & Son, Ltd.,** will be at 21, Tothill Street, Westminster, S.W.1 (telephone: Trafalgar 3686/7).

Ekco-Ensign Electric, Ltd., has appointed Mr. H. J. Price as its representative covering Oxfordshire, Berkshire and Buckinghamshire, and Mr. B. A. Edenborough to cover the south-west of London area. They will operate from the company's southern sales office at 45, Essex Street, Strand, W.C.2.

Electrical Situation in Pakistan

Growth of Local Industries

THE stringent import licensing control which has been in force since 1952 because of Pakistan's overall adverse balance of payments position has stimulated the growth of local industries and has thus affected a section of the market where United Kingdom products have held a predominant position. This is stated by Mr. F. B. Arnold, C.M.G., O.B.E., United Kingdom Senior Trade Commissioner in Pakistan, in his survey (dated May, 1954) of the economic and commercial conditions in Pakistan.* Referring to the tariff policy, Mr. Arnold says that local industries which already have some measure of protection include electric fans while other industries in respect of which Tariff Commission inquiries have been, or are being held, include batteries and battery plates, electrical accessories, incandescent lamps and diesel oil engines.

Demand for Heavy Electrical Equipment

The key to Pakistan's development is power. There is no manufacture in Pakistan of heavy electrical equipment, electric motors, transformers, generating equipment, etc. The large-scale development of hydro-electric and thermal power at present being carried out and envisaged, coupled with the general industrial development programme, has created extensive demands for this category of equipment and imports are likely to continue at a high level for a considerable future period. Many of these imports are on Government account. Imports of electrical machinery and parts on private account for 1952-53 (July-June) were valued at Rs. 145·1 lakhs and for the first six months of 1953-54 Rs.58·2 lakhs. The United Kingdom is the principal supplier (58 per cent in 1952-53) and Germany is her main competitor (22 per cent in the same year). A United Kingdom concern has a factory in Karachi to build switchgear up to 11 kV. Production is valued at something over Rs.5 lakhs a year, and the annual requirements of Pakistan are estimated at about Rs.10 lakhs. Two firms in Karachi make dry cell batteries. In January, 1954, a well-known United Kingdom manufacturer obtained permission to set up a factory in Karachi for the manufacture of storage batteries. Imports of batteries on private account in 1952-53 were valued at Rs. 23·3 lakhs and for the first six months of 1953-54 Rs.3·8 lakhs. Imports are mainly from the United Kingdom (26 per cent in 1952-53) and the United States (20 per cent in the same year).

There are two manufacturers of electric lamps in Pakistan, both of them situated in Karachi. One of these manufacturers is a combine of a local firm with an international group of lamp makers. This concern manufactures general lighting service lamps, train-lighting lamps and decoration lights. The other concern makes small special lamps such as flashlights and lamps required for automobiles. At an inquiry into the indigenous incandescent lamp industry held in January, 1954, the Tariff Commission estimated that the annual demand in Pakistan for general service lamps was between 1·5 million and 5 million, and for train lighting lamps between 75,000 and 100,000. Estimates for special type lamps varied between 1·5 and 3 million. Local production of general service lamps is said to have averaged about 1·5 million in the last three years. The production of small special lamps is estimated at 500,000 per annum. Imports for 1952-53 on private account totalled Rs.14·7 lakhs and for the first six months of 1953-54 Rs.4·4 lakhs, the principal suppliers in 1952-53 being the Netherlands (34 per cent) and the United Kingdom (31 per cent).

Electric fans are manufactured by fourteen firms situated in Karachi and in the Punjab, with one firm in East Pakistan. At a Tariff Commission inquiry into the fan industry in 1953 it was estimated that the demand was between 25,000 and 30,000 ceiling fans and 20,500 fans of other types. Production in Pakistan in 1952 was 14,516. The industry enjoys a protective duty of 45 per cent standard and 35 per cent United Kingdom preferential rate. Imports on private account in 1952-53 were valued at Rs.14·8 lakhs and for the first six months of 1953-54 Rs.0·8 lakhs. The great bulk of imports has been from the United Kingdom (72 per cent in 1952-53).

There is no local manufacture of domestic refrigerators and the demand is limited because of the high cost. Of the total of Rs.7·8 lakhs imported on private account in 1952-53, the principal suppliers were the United States (56 per cent) and the United Kingdom (29 per cent). The value of imports of refrigerating machinery in 1952-53 was Rs.15·1 and here again the principal supplier was the United States with 85 per cent, the United Kingdom supplying 10 per cent.

At the time of the report there was no manufacture of electric wires and cables in Pakistan. It was announced in May, 1953, however, that a company had been registered in Pakistan under the name of Pakistan Cables, Ltd., for the manufacture of electric wires and cables. The factory and equipment have been planned by three United Kingdom cable-making concerns in conjunction with local interests. The new company was to begin by manufacturing bare solid and stranded conductors, to be followed by the production of rubber insulated and p.v.c. insulated wires and cables. Imports on private account for 1952-53 were valued at Rs.101·9 lakhs and for the first six months of 1953-54 Rs.43·7 lakhs. Supplies in 1952-53 from the United Kingdom amounted to 62 per cent and from the United States 11 per cent.

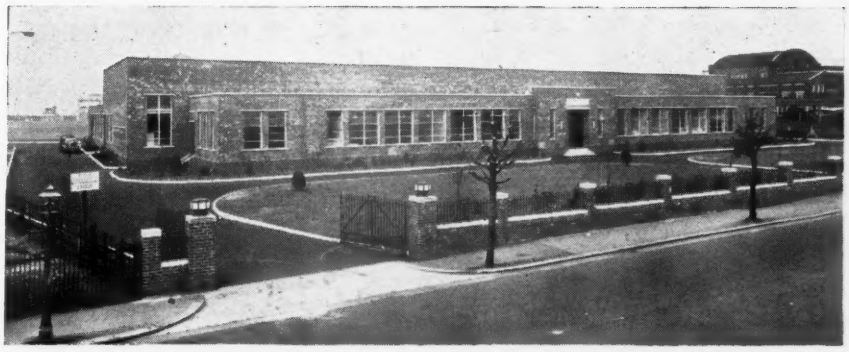
A number of electrical accessories and domestic appliances, e.g., switches, lampholders, cut-outs, plugs and sockets, lamp brackets, water heaters, etc., are produced in Pakistan on a cottage industry basis, the value of which in 1951-52 was estimated at about Rs.3 lakhs. Imports on private account were valued at Rs.15·8 lakhs in 1952-53 and Rs.8·9 lakhs for the first half of 1953-54.

Power Development

In June, 1954, the Pakistan Government announced that it proposed to set up a separate organization to deal exclusively with electricity problems. The Central Electricity Commission would be an advisory body to the Government and would be the precursor to a Power Development Corporation, an autonomous body invested with powers to put electrical development on a sound commercial basis.

At partition Pakistan found herself with woefully inadequate supplies of power. The installed capacity was only 71,000 kW. By December, 1953, this had risen to approximately 172,000 kW. Production has risen from 168·5 million kWh in 1948 to 425·2 million kWh in 1953. Power shortage has compelled many factories to install their own generating sets. Early in 1954 the Central Government engaged two firms of consulting engineers to carry out comprehensive power surveys and recommend a future power programme, one in East and one in West Pakistan. The possibilities for hydro-electric power development are, in the long term, likely to be more important than thermal power, although present plans for both in West Pakistan are likely to be affected by the discovery of natural gas in Baluchistan. The hydro-electric projects are generally multi-purpose and Mr. Arnold lists the principal multi-purpose and irrigation projects which have been completed, are under construction, or are contemplated. The principal scheme in this list is the Warsak Dam project from which it is estimated that 150,000 kW will be available. The proposed Mianwali multi-purpose project would provide a further 100,000 kW.

* H.M. Stationery Office, 10s net.



Works Training Scheme

Metropolitan-Vickers Education Organization

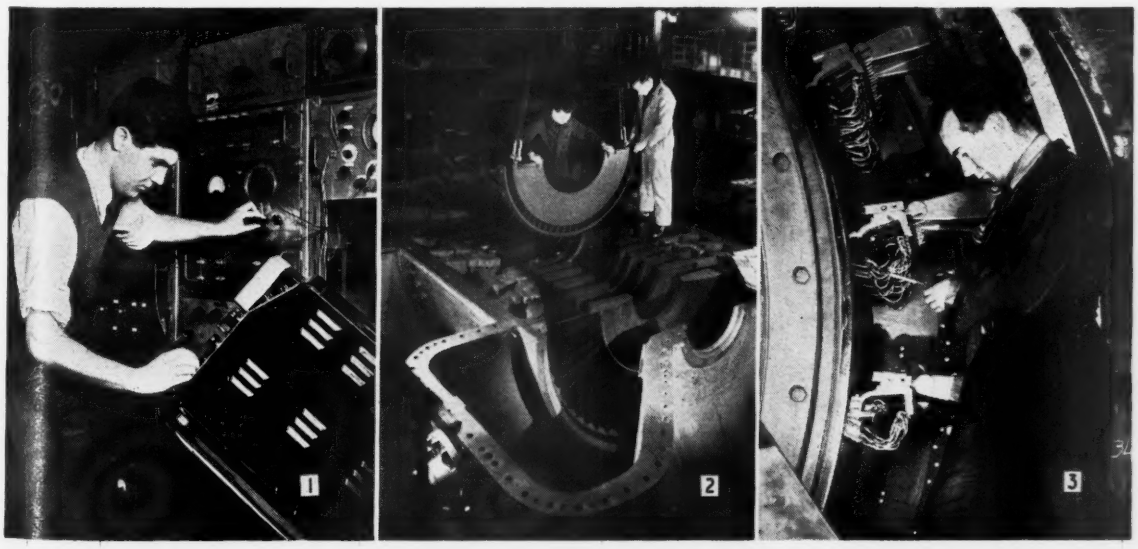
LAST week we took part in an organized visit to the Education Department of the Metropolitan-Vickers Electrical Co., Ltd., at Trafford Park, Manchester, where we saw and learnt a good deal of the background and organization of the company's exceptionally comprehensive educational undertaking.

There are two broad branches of the scheme—the training of professional apprentices and the training of craft apprentices. These activities embrace the use of an apprentice training school, a post-war development where 350 boys and young men are learning the elements of workshop practice; the works school, where commercial, technological and general classes recognized by the Ministry of Education are conducted; and "Kenwood," an apprentice club which provides a social and recreational centre for both craft and post-war graduate apprentices alike.

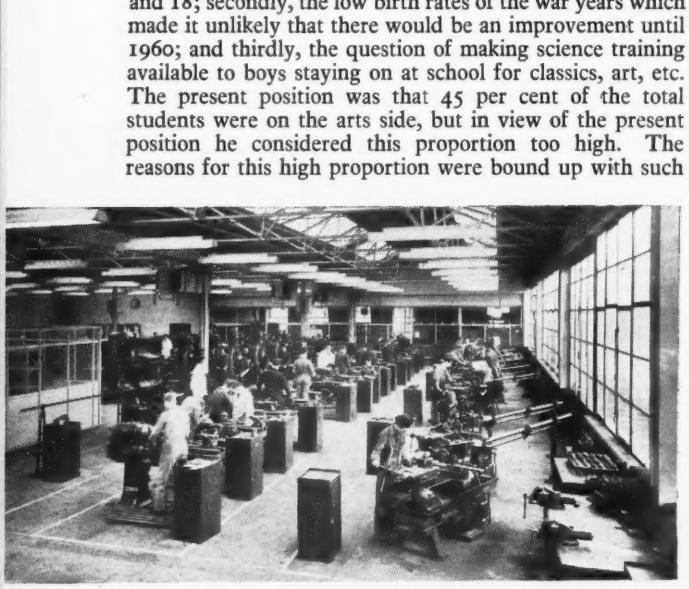
At the outset the party was welcomed by Dr. Willis Jackson, director of research and education, and by Mr. K. R. Evans, manager of the Education Department of the company, who outlined the work of the Department. Commenting on the present serious national situation in the shortage of technical men, Dr. Willis Jackson said that at the Metropolitan-Vickers works there were 25,000 employees and the works comprised perhaps a dozen factories producing major components, for example turbo-alternators, switchgear, meters, scientific apparatus, etc. Each department was managed by a triumvirate consisting of a chief engineer, a works manager and a sales manager. In addition to the production departments there were service departments and the Education Department was one of these. In the main, there were the two groups of apprentices to which we have referred.

The Education Department was started 40 years ago by Sir Arthur Fleming who at that time said that the most vital of the raw materials for the factory was the recruits. In engineering at present, said Dr. Jackson, there was a discrepancy of about 30 per cent between supply and demand of recruits. Since 1950 the graduates produced by the universities had doubled up on the number before

1. *In a radio design laboratory.* **2.** *Assisting in the erection of a large steam turbine.* **3.** *Test-bed experience with a large d.c. motor*



the war, but there had been no increase recently. The entrance from the schools was not keeping pace with the facilities and places in the universities. This question, the availability of young men, was bound up with three factors: first, the number of boys in schools between 16 and 18; secondly, the low birth rates of the war years which made it unlikely that there would be an improvement until 1960; and thirdly, the question of making science training available to boys staying on at school for classics, art, etc. The present position was that 45 per cent of the total students were on the arts side, but in view of the present position he considered this proportion too high. The reasons for this high proportion were bound up with such



The use of machine tools in the apprentice training school

considerations as tradition and the fact that so many school masters were themselves trained in the arts.

Mr. Evans said that a fundamental consideration of the whole scheme was training the man as against training the engineer; it was absolutely essential to get a mutual understanding between all grades, no matter what a man's label was. It was what he could do and how he applied himself during his training which really mattered. The great object was to get the right man in the right place and thus utilize the man to his maximum capacity. Another important point in the scheme was the effort to deter the student from taking on a wrong course of training.

With regard to the training of professional apprentices, a small selection committee composed of senior members of the staff and members of the Education Department pays a yearly visit to universities and senior technical colleges for the purpose of interviewing engineering students. If the result is favourable the candidate is provisionally accepted for a two-year college apprenticeship; acceptance is confirmed when his degree is awarded.

The aim of the present programme of graduate engineering training is to enable an apprentice in part 1 of the course on the one hand to obtain a thorough practical experience in the factory, and on the other hand to acquire —through lectures, discussions and departmental visits both formal and informal—experience and information from which he can determine the best line to follow, e.g., design, commercial engineering, manufacturing and research—with their many sub-divisions.

When an apprentice starts part 2 of the course he will thus have decided more or less on the product and the function of primary interest to him. Thenceforward his training will be sponsored by a departmental head, who will already have interviewed him and undertaken to engage him on the satisfactory completion of training. About eighty graduates are recruited for training from home universities each year.

Professional engineering apprenticeships are also available for public school and grammar school boys, who leave school from the ages of 16 to 19, and these schemes also cater for the young man who is entering industry for the first time after his national service.

Boys who leave grammar schools at the age of 16-17 take a five-year student engineering apprenticeship, called a special apprenticeship. In this, experience is gained in a variety of workshops, test beds and other departments, and the scheme provides trained men suitable for a wide range of work as technicians. Special apprentices take part-time technical courses on a day release basis, and those who indicate by their progress that they are likely to achieve professional qualifications are promoted to the school apprenticeship course.

The minimum age of entry for a school apprenticeship is 17, which ensures that most of the candidates have had at least a year at school after taking the G.C.E. examination at the ordinary level.

In selecting candidates for both the special and the school apprenticeship courses, particular attention is paid to the personal qualities of the boys and their probable future development as engineers in the broadest sense of the term.

Since its inception some five years ago, the company has supported the works-based "sandwich" diploma course held by the Salford Royal Technical College, and at the moment over fifty apprentices drawn from the school, special, and trade apprentice courses are taking the sandwich course. A large number of these men hold scholarships or special prizes awarded by Metropolitan-Vickers

The lounge at "Kenwood," the apprentices' club

and it is the company's intention to extend the range of such scholarships for these grades of trainee.

The principle of pre-university training for the professional engineer is now widely accepted, but it is worth recording that the company introduced this type of training as the probationary college apprenticeship course established in 1929. For many boys this sequence of practice, theory and practice provides the best arrangement of training. The first year of works experience acts as a prolonged vocational guidance period and enables certain apprentices to select professions other than engineering.

A feature of the pre-university period of training is the provision of a special day-release course at the Salford Royal Technical College. This course broadens the apprentice's knowledge of mathematics, physics, and the like, without anticipating the first year of university work, and prevents a young man from becoming "stale." Instruction in drawing office practice is given (as with all apprentices) in the Metropolitan-Vickers Works School. About thirty-

five boys are accepted for the probationary college apprenticeship course each year.

Trade apprenticeship at Metropolitan-Vickers is primarily intended for the training of skilled craftsmen. Every effort is made, however, to discover the full capacity of each boy in order that he may be considered for alternative work should his technical and practical progress prove his suitability.

The suitability of candidates for entry into the works as probationary trade apprentices is determined by their general education, apparent physical fitness, school reports and other relevant factors. Candidates are required to take a written examination of an elementary type appropriate to the leaving standard of the type of school attended. In addition to the written examination the boys are interviewed by a member of the Education Department staff. Selected candidates commence their training in the apprentice training school where they receive ten months' full-time instruction in engineering workshop practice. This period is divided into seven months' basic training and three months' intensive training.

All probationary trade apprentices complete the basic training course, irrespective of the trade they wish to learn, as it enables them to obtain an elementary knowledge of a number of occupations in the class of engineering carried out by the company and helps them to decide, if this is necessary, the trade for which they are most suited. During the seven months they work in the sequence named at fitting, forging, welding, sheet metal shaping, instrument making, machining and armature winding.

After completing the basic course each boy is interviewed by the chief instructor, and the type of training during the three months' intensive course is determined. Occasionally in trades where only small numbers of apprentices are required more boys apply for the trade than can be absorbed. This difficulty is overcome by carefully checking up the boys' progress sheets and selecting those who, in the opinion of the instructors, appear most suitable.

Throughout the period spent in the apprentice training school boys attend lectures relating to the type of work on which they are employed, for approximately five hours each week. After completing their ten months in the training school the boys are transferred to the manufacturing departments where they continue their training " on the job " until their 21st birthday. It is regarded as essential, however, that each boy receives a comprehensive training and obtains the maximum of experience during the period he spends in each department or section.

Speeding Vehicle Chassis Manufacture

A CHASSIS frame drilling jig in which 42 Black & Decker ⅜in heavy duty drills are used has been put into operation by Seddon Diesel Vehicles, Ltd., Oldham, Lancs. It is being used to drill all the rivet and bolt holes for the cross-members and spring hangers on the Seddon " 25," a small chassis powered by a 34 b.h.p. diesel engine. Since the jig has been put into service, the chassis frame drilling time has been reduced to one-third of that previously taken.

Designed by the vehicle manufacturers after consultation with Black & Decker, the jig consists of a steel framework on which six laterally sliding carriages are arranged in pairs facing each other along the length of the jig. The portable tools are mounted on the carriages and form two banks. The design of the jig is such that two chassis frames can be placed back to back between the left- and right-hand banks of drills, and when they are in position they are firmly held in place by means of screw operated clamps.

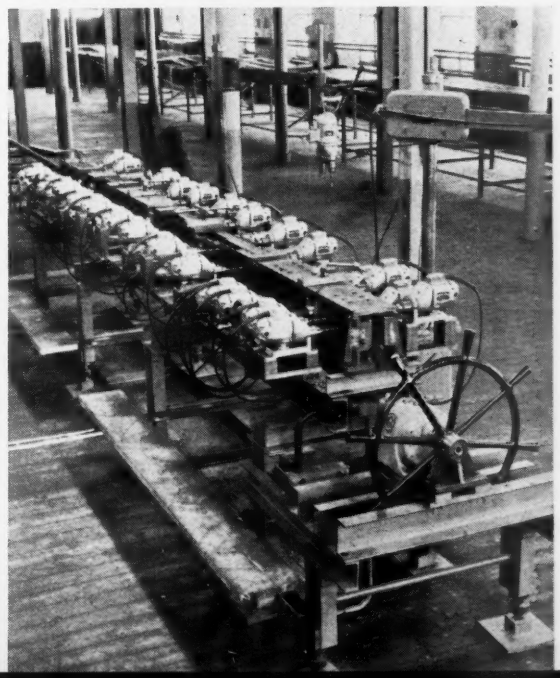
A central shaft running the length of the jig carries six pinions which mesh with teeth cut in racks attached to each carriage. Thus, if the shaft is rotated in a clockwise direction, the racks simultaneously move towards the right and vice versa. As the carriages are attached to the racks they will also move in the same direction. The only modification to the power tools mounted in the jig is that the combined side handles and switches are removed, and junction boxes fitted in their place. These are wired to master switches controlled by the operator and it is possible to switch on all the drills in one bank simultaneously.

To drill a pair of chassis frames, the operator switches on the left-hand bank and rotates the shaft in a clockwise direction, thus bringing the drills up to the work. If the shaft is rotated still further the drills will enter the work and finally break through. When this occurs the shaft is rotated anti-clockwise, thus retracting the left-hand bank and simultaneously bringing up the right-hand bank, which is then switched on. In practice it was found that one operator could not bring sufficient force to bear on the shaft to allow satisfactory operation, and a capstan wheel was fitted at one end of the jig, driving the shaft through 4:1 reduction gear. This modification now enables each bank of drills to be fed into the work smoothly and without undue pressure from the operator.

So that all the drills do not start drilling simultaneously, the twist drills are inserted in their respective chucks at varying positions in relation to the face of the chassis frame sides. Accuracy of the holes drilled in the frames is ensured by means of hardened steel drill bushes. The frames when mounted in the jig for drilling are inverted, and when drilling of the side holes has been completed by the two banks of ⅜in heavy duty drills, a number of holes are then drilled in the frame flanges. This is effected by two ½in heavy duty drills mounted in vertical stands carried on sliding arms. The positions of the holes are located by hardened steel bushes mounted on the jig above the frames.

After all drilling operations have been carried out the frames are removed and all holes deburred by means of a countersink mounted in a similar ¼in heavy duty drill. When this operation has been completed the frames are then bent to shape and passed on to the assembly line.

Chassis drilling jig in use



Auxiliary Oil Firing of Boilers

Demonstration at Earley Power Station

A DEMONSTRATION of its type FF1/80 initiators for operation in conjunction with pulverized fuel fired boilers was given last week at Earley power station, Reading, by Fuel Firing, Ltd. The company has been working on the development of equipment of this nature since it was formed in 1951 and the success of its work is shown by extensive orders placed by the Central Electricity Authority.

With the growing tendency to two-shift operation, the rapid and easy starting up of large p.f. fired boilers becomes of much more concern. The use of these burners achieves this and enables boiler pressure to be raised without the risk of overheating the superheater elements, as can easily happen when starting up on coal. In addition, it is possible to stabilize combustion against risk of flame failure and explosion, owing to variations in the coal condition.

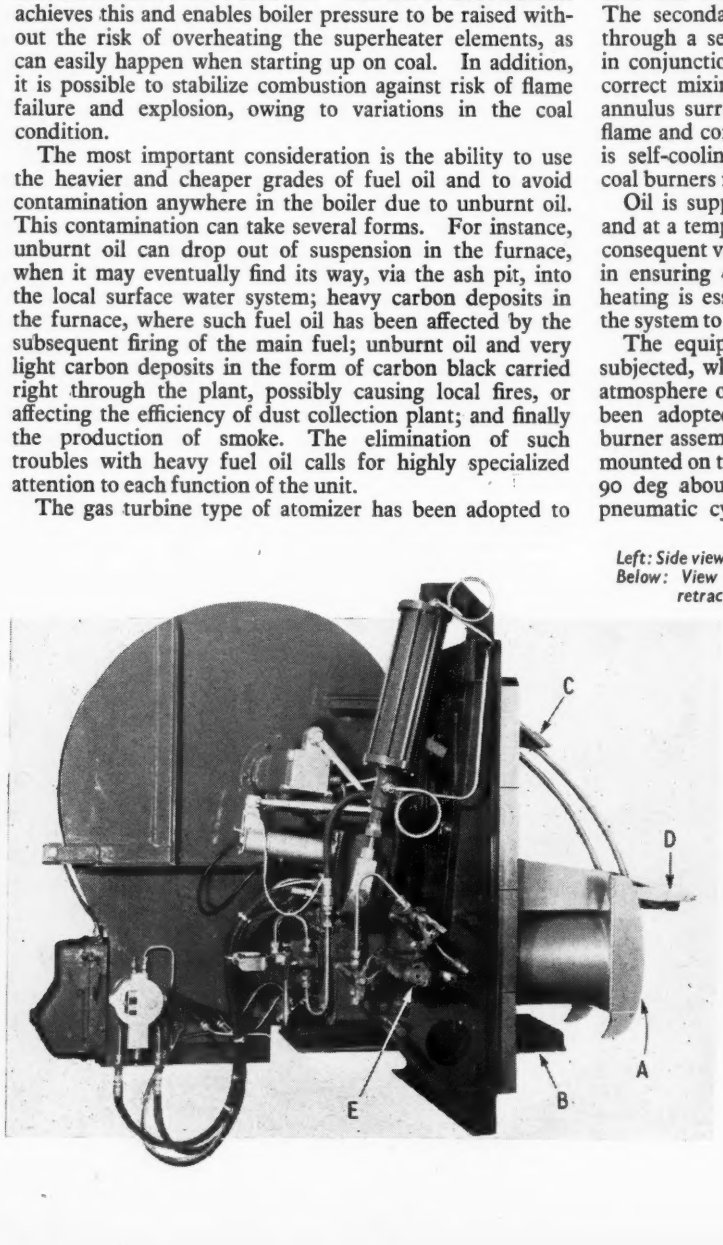
The most important consideration is the ability to use the heavier and cheaper grades of fuel oil and to avoid contamination anywhere in the boiler due to unburnt oil. This contamination can take several forms. For instance, unburnt oil can drop out of suspension in the furnace, when it may eventually find its way, via the ash pit, into the local surface water system; heavy carbon deposits in the furnace, where such fuel oil has been affected by the subsequent firing of the main fuel; unburnt oil and very light carbon deposits in the form of carbon black carried right through the plant, possibly causing local fires, or affecting the efficiency of dust collection plant; and finally the production of smoke. The elimination of such troubles with heavy fuel oil calls for highly specialized attention to each function of the unit.

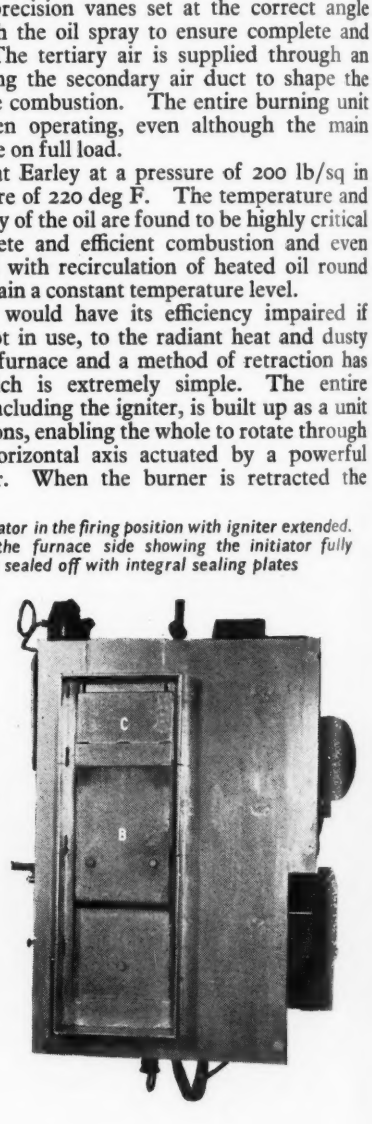
The gas turbine type of atomizer has been adopted to give a very finely divided spray pattern of a known shape and consistency. Complete combustion not only requires good atomization, but also the admixture of all parts of the oil spray with air in the correct calculated quantity and at the right velocity. The initiator ensures this by taking air from its own integral fan at a pressure of 5in w.g., supplying it into a duct coaxial with the burner and dividing into primary, secondary and tertiary air supplies at the burner head. The primary air is used to establish stability of the flame and is sufficient to keep the atomizer cool and free from carbon under operating conditions. The secondary air is introduced round the primary air through a set of precision vanes set at the correct angle in conjunction with the oil spray to ensure complete and correct mixing. The tertiary air is supplied through an annulus surrounding the secondary air duct to shape the flame and complete combustion. The entire burning unit is self-cooling when operating, even although the main coal burners may be on full load.

Oil is supplied at Earley at a pressure of 200 lb/sq in and at a temperature of 220 deg F. The temperature and consequent viscosity of the oil are found to be highly critical in ensuring complete and efficient combustion and even heating is essential with recirculation of heated oil round the system to maintain a constant temperature level.

The equipment would have its efficiency impaired if subjected, when not in use, to the radiant heat and dusty atmosphere of the furnace and a method of retraction has been adopted which is extremely simple. The entire burner assembly, including the igniter, is built up as a unit mounted on trunnions, enabling the whole to rotate through 90 deg about a horizontal axis actuated by a powerful pneumatic cylinder. When the burner is retracted the

Left: Side view of initiator in the firing position with igniter extended. Below: View from the furnace side showing the initiator fully retracted and sealed off with integral sealing plates





furnace port is closed by a self-cooling sealing plate B mounted on the rotating unit; similar plates ensure that the burner closely fits this port in the operating position. A hinged flap C overlaps B in the closed position, giving complete sealing of the port.

The igniter element D is contained in a housing directly above the main air tube A and is protected by a hinged front door and cool air bled from the main fan ducting. It is projected forward when required, into the atomizer spray cone, by means of a second pneumatic cylinder for the short period of time necessary for ignition and is then withdrawn behind the protective door.

Method of Operation

The initiator is operated by means of a control station comprising two push-buttons, six indicating lights and a four-position rotary selector switch mounted on the main boiler control panel. On pressing the "start" button, a solenoid valve is energized, routing compressed air to the cylinder, which swings the initiator into the furnace, the transit causing the operation of an auxiliary switch, which energizes a second solenoid valve through a time delay relay and routes compressed air to the pneumatic cylinder controlling the position of the igniter element. This element is thus projected from its housing as the burner swings into the operating position and is at white heat immediately it is extended.

The transit of the burner to the operating position simultaneously operates mechanically two high-pressure oil cocks connected in series, by means of a cam E mounted on one of the trunnions. This causes oil to be admitted to the atomizer simultaneously with the burner taking up its operating position. Normally, ignition occurs immediately and a flame is established within two seconds of the "start" button being pressed. At this stage of the operating cycle, the indicator lights in the main control panel show "fan on," "igniter in" and "flame in." The time delay relay, which starts to operate at the beginning of the cycle, continues for a period of approximately three seconds and causes the igniter element to withdraw to the fully retracted position, when the indicator lights show "igniter out" and "flame in." The "fan off" indication is shown until the fan is running.

In the event of no flame becoming established for any reason whatever, the time delay relay, operating in conjunction with a photo-electric flame failure device mounted on the closing plate, causes the burner to swing out of the furnace and the "flame out" indication is given on the control panel. After the burner has been withdrawn due to a flame failure, the initiator cannot again be operated until the "shut down" push-button has been pressed to re-set the flame failure relay. When ignition is established the initiator remains in operation until the "shut down" push-button is depressed.

The igniter used consists of an opening at the end of a steel cylinder, exposing a carbon rod held by spring pressure against a carbon disc. About 60 A at 20 V is passed through this contact when ignition is required and this has been found completely successful. The original system utilized ignition at 10,000 V and was erratic in operation. Should the compressed air supply or the electrical supply fail, or ignition fail during operation, shut down is automatic, and the burner withdraws itself from the furnace.

A development of the control system known as combustion stability control provides for the automatic introduction of the initiators on falling furnace temperature. This is achieved by twin photo-electric viewers scanning the hottest zone of the furnace, one being called the "monitor viewer" and the other the "lockout viewer." The "monitor" has adjustable sensitivity set to close a relay at a predetermined furnace temperature, the closure causing the initiator which has been selected to swing into operation. This circuit is so arranged that, on selection of any given initiator for combustion stability control, any failure whatsoever in the circuit causes the initiator to operate and bring about a safe condition from the point of view of explosion risk. Notwithstanding this safety measure, the "lockout" viewer on an entirely separate circuit, is set to close on a furnace which has become extinguished and this relay automatically isolates all the electric supply to the initiators, rendering them inoperable.

Observations at Earley power station with this control gear during a two-shift operation have shown that the initiators, on average, become actuated approximately half a minute before ignition of pulverized fuel is lost.

These burners, which take about 800 lb of oil per hour, can be used to boost the output of a boiler to compensate for poor coal; and tests have also been carried out on the control of superheat temperature when boilers are being brought on a range, so that it is possible to match the turbine casing temperature with steam temperature without recourse to steam dumping when starting up alternators. Two initiators can be mounted in the superheater zone for this purpose and others in the normal position. Yet another avenue of use being explored is the starting from cold of chain-grate stoker fed boilers. A recent test with a cold bed of coal on the stoker had combustion completely under way in less than two minutes. Cost comparisons in the Southern Division of the C.E.A. have shown a saving in fuel cost over the older techniques of starting, as well as a reduction in superheater maintenance, etc. A useful feature of these initiators is that in the retracted position they can be serviced while the boiler is on load.

Added interest was given to the demonstration by the use of Marconi television equipment to permit viewing of the burners igniting as seen from inside the furnace, and also of the pulverized fuel being lit from the burning oil sprays. It is for uses of this type that closed circuit television comes into its own.

The developments described were carried out by Fuel Firing, Ltd., in conjunction with Charrington Gardner & Locket (London), Ltd., and the Southern Division of the Central Electricity Authority who made available the No. 7 boiler at Earley for experimental work.

Industrial Atomic Power

THE first use for industrial purposes of electricity generated by atomic power is reported from Schenectady, New York, where the Niagara-Mohawk Power Corporation, whose lines supply the West Milton atomic site with electricity, fed into its public utility system power generated by the working model of an atomic submarine engine.

According to *The Times*, the reactor, designed and built at the A.E.C. Knolls atomic power laboratory by the American General Electric Co., is the counterpart of the reactor which is to be installed in the atomic submarine *Sea Wolf*, which was due to be launched yesterday (Thursday) at Groton, Connecticut. Mr. Lewis Strauss, chairman of the Atomic Energy Commission, speaking on the occasion, said that in two years or less the first full-scale plant to produce electrical power from atomic energy would be supplying 60,000 kW to the Pittsburgh area. American companies and groups of companies in various parts of the United States stood ready to build six commercial atomic power plants with a total capacity of 765,000 kW and have them completed within the next five years, at a total cost of $250 million.

I.E.C. Meeting

Preliminary Report of Proceedings

THE twentieth general meeting of the International Electrotechnical Commission was held at British Standards House, the headquarters of the B.S.I., from 28th June to 9th July. As was recalled by Col. B. H. Leeson, chairman of the British National Committee, at the opening session, seventeen years have passed since the I.E.C. last held a general meeting in this country. That meeting (in 1938) was held in Torquay and the twenty technical Committees were attended by a total of 250 delegates. This year nearly thirty technical committees (about half the total number of I.E.C. committees) held meetings and the number of delegates was about 500, representing 26 countries. There were nine delegates from the U.S.S.R. and a total of 20 from the "Iron Curtain" countries. Including wives of delegates the total registrations numbered 650—the largest yet, except for the golden jubilee meeting last year in Philadelphia. As already reported, at the meeting of the Council on 8th July, Dr. P. Dunsheath was elected president in succession to Dr. H. S. Osborne (U.S.A.), and Mr. A. Roth (Switzerland) was elected treasurer in succession to Dr. Dunsheath.

Committee of Action

Canada, France and Germany were elected to the Committee of Action, a nine-country group which acts as an executive committee between meetings of the Council. The other current members of the Committee are Belgium, Italy, India, the Netherlands, Norway, and the United Kingdom, the countries which have just retired (after serving for nine years) being Czechoslovakia, U.S.A. and U.S.S.R. The scope of the technical topics discussed during the London meeting is illustrated by the following list of subjects on which recommendations for international standards have been completed:—

For publication: a basic list of graphical symbols; dimensions of the duodecal 12-pin radio valve base; rated characteristic impedances and diameters of radio frequency cables; fixed paper capacitors for d.c., including a colour code; domestic plugs and socket outlets; glass insulators for overhead power lines.

For circulation (under the two months' procedure) for final approval: dimensions of sub-miniature outline gauges for radio valves; unit testing of circuit-breakers; operating conditions for circuit-breakers; amendments to I.E.C. Publication 67, Radio Valves.

For circulation (under the six months' rule) for provisional approval: terminal markings for power transformers and instrument transformers; markings for identification of conductors; graphical symbols for resistance, inductance, windings, capacitors, machines and transformers; classification of wiring diagrams; new types of radio valve bases; bushing insulators; rules for strength of insulation of circuit-breakers; Edison screw lampholders; metallized mica capacitors (receiver type), including a colour code; fixed carbon composition resistors; general requirements and methods of measurement for radio frequency cables; commercial hard-drawn aluminium wire for electrical conductors; aluminium alloy wire of the Al-Si-Mg type for overhead lines; commercial aluminium busbars; measurements on television receivers; supplement to I.E.C. Publication 71, rules for co-ordination of insulation; power capacitors for use under tropical conditions; valve-type lightning arrestors.

Among other subjects discussed, but for which further study by the National Committees is required, are the following for which draft recommendations are in an advanced stage:

Test methods for the determination of losses in rotating machinery; rules for intermittent rating of rotating machinery; ball and socket couplings for suspension insulators; rules for the rating and testing of circuit-breakers with respect to the switching of line charging and capacitor bank currents; measurement of inherent restriking voltage of circuit-breakers; rating of power circuit-breakers; co-ordination of rated voltages, rated breaking capacities and rated normal currents of circuit-breakers; dry-type (semi-conductor) rectifiers; galvanized steel wire for steel-cored conductors; series capacitors for power systems; medium-frequency power capacitors.

The minutes and related documents to be issued as a result of the meetings will be referred to the appropriate B.S.I. Committees for consideration.

The programme of technical meetings was supplemented by numerous visits to factories and other places of technical interest, including the Science Museum, the N.P.L., the Royal Festival Hall, the B.B.C. television studios and the Acton works of London Transport. A special programme of visits and excursions was arranged for the ladies.

Visits to Cambridge, Windsor Castle and the Houses of Parliament, receptions at Lancaster House, London University and the Institution of Electrical Engineers, a banquet at Guildhall, and the le Maistre Memorial Lecture at the Royal Institution, all combined to show foreign visitors something of our culture and traditions.

The B.S.I. acted as general host and made all the arrangements, both technical and social, and provided staff and general facilities. The whole programme was financed and made possible by the generous co-operation of numerous institutions, associations, organizations and firms in the electrical and related industries.

The general meeting of the I.E.C. in 1956 will be in Munich, and for 1957 an invitation from Madrid has been provisionally accepted.

BOOKS RECEIVED

Magnetic Materials in the Electrical Industry. By P. R. Bardell, B.Sc., M.I.E.E., F.Inst.F. Pp. 288; figs. Macdonald & Co. (Publishers), Ltd., 16, Maddox Street, London, W.1. Price 32s 6d.

Electro-Technology. By M. G. Say, Ph.D., M.Sc., M.I.E.E. Pp. 167; figs. George Newnes, Ltd., Tower House, Southampton Street, Strand, London, W.C.2. Price 10s 6d.

Photo-Electric Handbook. By G. A. G. Ive. Pp. 152; figs. 108. George Newnes, Ltd. Price 17s 6d.

Storage Batteries. By George Wood Vinal, Sc.D. Pp. 346; figs. Chapman & Hall, 37, Essex Street, London, W.C.2. Price 80s.

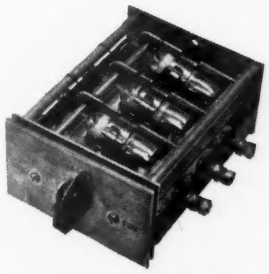
Foundation Engineering. By Rolt Hammond, A.C.G.I., A.M.I.C.E. Pp. 192; figs. Odhams Press, Ltd., Long Acre, London, W.C.2. Price 21s.

Electrical Characteristics of Overhead Lines. By S. Butterworth, O.B.E., M.Sc. Pp. 238. Electrical Research Association, Thorncroft Manor, Dorking Road, Leatherhead, Surrey. Price 42s.

NEW ELECTRICAL EQUIPMENT

Hand Mercury Switch

ENGEL & GIBBS, LTD., Warwick Road, Boreham Wood, Herts, have recently introduced a hand operated



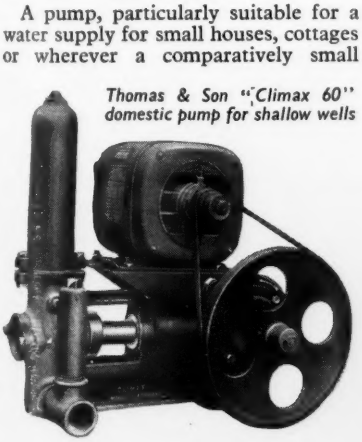
Multiple mercury switch

multiple mercury switch. These are useful for such applications as hospitals for the control of apparatus in operating theatres, and in industrial applications where the situation would render a normal switch useless in a short time.

The unit mounts up to four 15 A mercury switches and can have up to four movement positions. Spring clip stops are fitted to give positive location in each position. All parts are designed to work under normal ambient temperatures and up to 100 deg C. The finish is cadmium plated.

Shallow Well Pump

A pump, particularly suitable for a water supply for small houses, cottages or wherever a comparatively small



Thomas & Son "Climax 60" domestic pump for shallow wells

capacity is required has recently been introduced by THOMAS & SON (WORCESTER), LTD., Worcester.

Special attention is drawn to the low speed (260 r.p.m.) at which this pump, the "Climax 60" domestic, operates. The pump body consists of a robust monobloc high grade iron casting and the plunger is of stainless steel. There are no cup leathers or cylinder liner. The driving shaft is supported by long bearings formed in the cover housing and is connected to the plunger by a large eccentric. The gland is of a special design and self-adjusting and the valves are of the spring-loaded rubber disc type with brass grid seats. Lubrication is entirely automatic and the oil need only be replenished about twice a year.

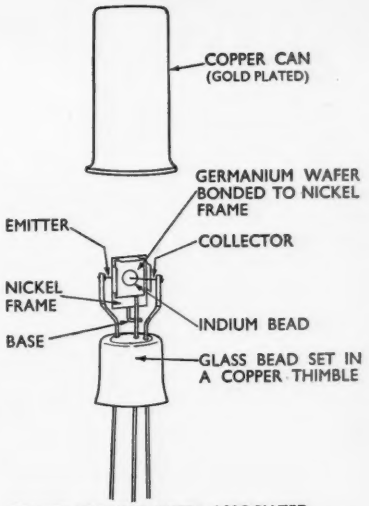
Using a $\frac{1}{6}$ h.p. motor, it has an actual capacity of 110 gal/hr, the total head being 80ft. Another model incorporates a $\frac{1}{4}$ h.p. motor with a similar output and a total head of 100ft.

The prices of the a.c. single-phase models are: £20 ($\frac{1}{6}$ h.p.) and £22 ($\frac{1}{4}$ h.p.). Prices for the pump with motor for three-phase a.c. or d.c. supplies are available on request.

Junction Transistors

The GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, London, W.C.2, has introduced three new germanium alloy type p-n-p junction transistors, which offer the designer a range of ratings and characteristics. The type EW58 is intended for low voltage (up to 5 V) audio frequency applications such as hearing aid amplifiers. The type EW59 can be used at supply voltages up to 20 V; as a small signal amplifier it can be used at frequencies up to about 0·5 Mc/s, and in Class B audio frequency output stages outputs of up to 300 mW can be obtained at low distortion. The type EW53 can be used at supply voltages up to 10 V but has a slightly lower frequency and power output range than the EW59.

All three are hermetically sealed in gold-plated metal cans, and are independent of variations in humidity. The cans are identical for all three



COPPER THIMBLE WITH ASSOCIATED WIRES ETC. IS BONDED TO COPPER CAN, SO THAT THE COMPLETE UNIT IS HERMETICALLY SEALED.

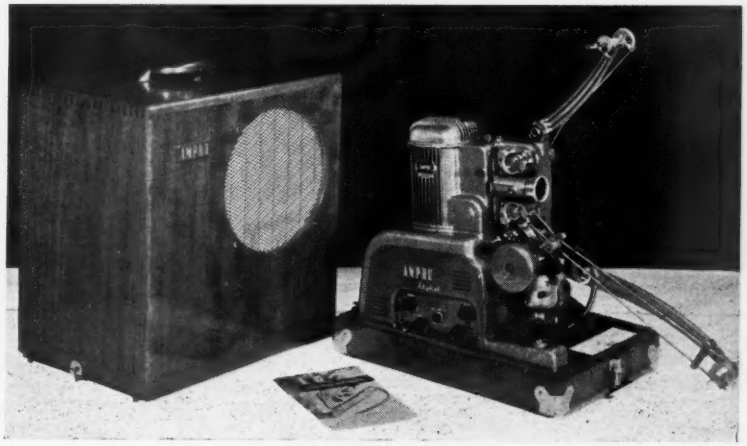
Diagram showing construction of G.E.C. junction transistor

transistors and measure 11 mm in length by 5 mm in diameter.

Projector for Marine Use

KELVIN & HUGHES, LTD., Livingstone College, Knotts Green, Leyton, E.10, have added to their range of ciné projectors for use at sea, in view of the increasing demand for this type of equipment. Their new "Stylist" projector is offered in a polished mahogany case incorporating a 10in speaker. The spool arms are folding and permanently attached to the projector, giving ease of operation and, due to the design, a quick method of film threading. The projector is of rugged construction and has a film capacity of 2,000ft. Three models are available, for operation direct from 90/110 V d.c., from 110/125 V d.c. or a.c. or, with a transformer, from 200/250 V a.c., and for operation direct from a.c. or d.c. voltages of 200/250.

"Stylist" projector for marine use



Combustion Engineering Conference

Instrumentation and Fuel Efficiency

"INDUSTRY does not realize how coal supplies will dwindle within the next few years." This warning, given by a number of speakers, was the keynote of the Combustion Engineering Association and the British Industrial Measuring and Control Apparatus Manufacturers' Association's joint conference on 6th and 7th July.

Opening the conference, the president of the Combustion Engineering Association, Mr. H. C. Hawkins (B.X. Plastics) said that both Associations shared the object of trying to achieve more efficient control and instrumentation of boilers and to avoid the wanton waste of coal in factories and boiler houses. Managements ought to realize that a ton of coal was just as much a ton of raw material as was any other commodity coming into the factory. By controlling combustion, 50 per cent efficiency instead of the present average of 40 per cent could be achieved, releasing for export coal to the value of £30 million and also lessening the smoke nuisance. He advocated instrumentation however small the economic savings.

Mr. G. P. Clay (I.C.I. Metals Division) then introduced a paper entitled "The Economic Level of Instrumentation in Boiler Plants." The problem of instrumentation, he said, was to give the best operating efficiency with the minimum of maintenance at the lowest capital cost having regard to the resulting economies at the mid-life of the plant. With rising fuel costs it would be wise to err on the comprehensive side provided that it did increase fuel efficiency for all combustion conditions at all times under varying loads. Instruments should be as simple as possible and the panels should be grouped strictly according to operational requirements. From the records of operation the plant efficiency could be worked out. Early and clear indication of gradual drifts from optimum efficiency should be obtainable. Tapping points must be a minimum to avoid leaks in the boiler casing. Absolute consistency in readings was necessary but the "absolute accuracy" need be only that requisite in each case. All instruments should be on "scheduled" or "preventive" maintenance, particularly as regards automatic control.

The smaller the plant, the higher would be the cost expressed as a percentage of the capital cost of the boiler, which might reach 17½ per cent for a 3,000 lb/hr shell boiler, decreasing to about 2¼ per cent for a 200,000 lb/hr water tube boiler. Instruments should be installed only when this would produce a reasonable return on their cost, except at the start up of the plant, when extra instruments (to be taken out later) could be provided. Automatic control helped to reduce the gap in efficiency between results obtained in day-to-day operation and in acceptance tests, and it followed load changes more accurately.

Importance of Skilful Operation

The degree of complication of instrumentation was largely determined by the technical ability of the operating personnel to make really effective use of the equipment. A higher instrumentation level could be justified only if a high degree of maintenance skill (which was very scarce) was available. Systematic careful training of boiler operatives would pay handsome dividends and the question of their remuneration ought to receive careful consideration.

To operate any boiler with a reasonable degree of efficiency a certain minimum number of instruments was necessary. Instrumentation had increased the efficiency of shell type boilers by 5 per cent, while it made possible the operation of large water tube units. Its cost was usually 8 to 10 per cent of the boiler capital cost with shell type and 3½ to 4 per cent for larger water tube boilers. For shell boilers 8 to 10 per cent should be an average basic minimum.

Opening the discussion, the chairman emphasized the need for robustness. Managements, he stated, needed educating into the idea of spending small sums on instrumentation at first, gradually increasing the amounts as the results were shown to justify the expenditure. He considered that the standard of accuracy of CO_2 at $\pm$ 2 per cent was quite reasonable, since thousands of shell boilers were running at only about 30 per cent efficiency.

Mr. R. G. Kent (Geo. Kent, Ltd.) remarked that of the 45,000 shell boilers in the country, very few were equipped with instruments up to the required level. In some cases the cost of the instruments had been paid for within two years or less. Comparison on a capital cost basis was misleading and he could see no good case for automatic control of small boilers.

Mr. R. Nichol (Arthur Guinness) suggested that saving in operating cost gave a more accurate comparison than capital cost. The effect of automatic control extended beyond the boiler itself. A steady steam pressure improved process work, particularly with back-pressure turbines, and guarded against inaccuracies in recording. Smoke density meters could be used also as combustion meters by regulating the air to the extent that smoke was just on the point of being formed.

Mr. G. Doxey (I.C.I.) said that no instrument, as distinct from automatic control, would, of itself, save money unless it were looked at. Changes of boiler losses should be measured for making comparisons.

Views on Standardization

Mr. Cameron (Babcock & Wilcox, Ltd.) held that if users would allow instrument makers to standardize (as in America) prices might come down, but the chairman believed that users, having more knowledge of operation than the instrument makers or boiler manufacturers, were the best judges, and he recommended that the views of users should be ascertained as to the minimum instrumentation required for various types of boilers.

Mr. C. E. Needham (Coalite & Chemical Products) said that so many factors determined the efficiency of boilers that errors of $\pm$ 2 per cent might well end up as 10 per cent. The question was whether efficiency should be determined by summation of losses or by direct measurement of input and output.

Mr. M. S. Gaskill (West Gas Improvement Co., Ltd.) said that the best basis for inquiry was the minimum amount of instrumentation that the user was prepared to buy and maintain. As an alternative to relating instrumentation cost to boiler capital cost he suggested an assessment of the cost per ton of fuel used over a period of years.

Mr. R. H. Paddon-Row (Institute of Marine Engineers) said that the capital cost basis was a failure, particularly for oil-fired installations.

Mr. C. H. G. Hayward (Edwin Danks & Co. (Oldbury), Ltd.) said that faulty instruments not correctly maintained

were worse than having no instruments at all. He asked for a simple form of automatic control, which could be checked daily, for shell boilers. The elaborate types of control justifiable for water tube boilers should not be adopted for use with shell boilers.

The chairman, summing up the discussion, said that the two greatest needs apparent were for education of managements and education of people handling boilers. In view of the coal situation, the efficiency of even the oldest boilers must be raised. Unless boiler efficiency throughout the country was raised by 10 per cent some industries would have to shut down. Oil could not make up the coal deficiency and atomic energy would not be available in time. Boiler makers, instrument makers and users must get together and devise robust instrumentation which would be easily put in and easily maintained.

Smoke Reduction

In the afternoon Rear Admiral Sir Sidney Frew (Ministry of Fuel and Power) presented a paper on "Smoke Reduction and Fuel Efficiency by Measurement and Control." Measurement, he said, was the first step in any works campaign for fuel economy. Improvement necessitated a study of existing conditions against a theoretical yardstick. Automatic control was not only more dependable than manual control but also effected improvement in thermal economy, subject to proper control and maintenance.

All boiler plant, no matter how small, ought to be equipped permanently with such instruments as would indicate that its operation was as efficient as possible. The instruments needed would be determined by the size, nature and layout of the plant, but they should include a feed-water or steam-flow meter, a means of determining the quantity of fuel burned, draught gauges, a CO_2 indicator or recorder, thermometers, a pyrometer and a smoke indicator or recorder.

Managements should ensure that plant personnel fully understood the use of the instruments, which should be located in a readily accessible position—preferably on a central panel—and maintained in accurate working condition. The amount of air required for combustion must be carefully correlated to the quantity of fuel being burned, since losses in this respect accounted for the greatest wastages in boiler plant. Deterioration in CO_2 from 14 to 9½ per cent, due to excess air, increased by 28 per cent the fuel consumption per pound of steam produced in a Lancashire boiler without an economizer and by 15 per cent with an economizer. Instruments for recording gas and CO_2 gas temperature were very helpful in achieving the correct fuel-air ratio, particularly as small shell plants had to deal with varying industrial and processing loads. Where the steam flow fluctuated appreciably a steam-flow meter enabled the requisite adjustments to be made, thus reducing the necessity for large alterations in the firing rate to restore the boiler pressure to normal.

In general, instrumentation saved 10 per cent of fuel consumption. Smoke density meters must be sited in positions which would facilitate cleaning and periodic adjustment of their settings. The main purpose of automatic control was to balance input against output rather than to maintain a steady steam pressure.

Mr. R. Nichol expressed the view that it was up to the user to define his own requirements. Volumetric measurement of coal was obtainable with a weighed intake to within 0·5 per cent.

Mr. F. W. C. Hinton (I.C.I.) said that random checks had shown errors of 1 or 2 per cent in Coal Board weights. The main difficulty was to assess the weight of combustible matter in coal when assessing boiler efficiency.

The chairman called upon the instrument industry to tackle the difficult problems of the segregation of secondary air from primary air and the simultaneous control of both.

Mr. H. W. Blake (president of B.I.M.C.A.M.) said that many new types of instruments had been designed for which a need was thought to exist; users could help by trying out such new developments under practical conditions.

Mr. W. R. L. Kent (Kelvin & Hughes (Industrial), Ltd.) said that if the volatile content of the fuel was determined and the boiler makers provided a means of controlling secondary air by the ports usually placed above the grid, the instrument manufacturer was usually prepared to supply some sort of control over the whole air supply. It was for the boiler makers to determine the correct setting of secondary air for any fuel-air ratio.

In reply to Mr. Jason (Fuel Research Station), who asked if there was any alternative to the Ringleman chart for measuring smoke density, the author referred to the American smokescope, with which he had not been very favourably impressed during the short time that he had used it.

Mr. K. H. Sambrook (Shell Petroleum Co., Ltd.) said that the Ringleman chart gave greatly improved results in the form of a photographic plate so that the background of the chart was the same as that of the smoke. Dr. Owens had produced in this country a smokescope which gave on a rotating shutter the degree of obscuration of light which could be matched with the chimney emissions.

Mr. H. W. Arkell (Prat-Daniel (Stanmore), Ltd.) urged as a first need the capturing of the interest of people operating small boiler houses.

Mr. G. H. Collin (Shell Petroleum Co., Ltd.) said that in 50 per cent of the cases where liquid fuel was used the making of smoke was not connected with the air-fuel ratio. Often the oil-burning equipment chosen for the job was not suitable or had not been given the proper draught conditions.

Open Hearth Furnace Control

On the following morning, Mr. Neil H. Turner, of the Appleby-Frodingham Steel Co., Ltd., was in the chair when Mr. E. Whitehead (Appleby-Frodingham Steel Co.) presented a paper entitled "Open Hearth Furnace Control." Control had taken long to develop, he said, because each addition had revealed a necessity for changes in the design of furnaces or auxiliaries and because of lack of understanding of how to make use of the readings and how to apply controls to get consistent results.

The purpose of draught control was to keep the hot gases inside the furnace and the cold air out. The first necessary control was over the size of gaps round furnace doors, which might cause a heat loss of about 12·5 per cent. There was a real need to measure air flow through the furnace port, but the production of such an instrument seemed a long way off.

Measurement and control of roof temperature by present methods should be regarded as a tool helping to maintain control of the furnace, helping to keep the roof at the best temperature at any particular time and drawing attention to unbalance between the checker and preheat temperatures at the two ends of the furnace. He was not in favour of fully-automatic reversal but thought that the operation should be kept as easy as possible for the furnace man.

Mr. E. E. Cook (George Kent, Ltd.) submitted that the air-gas ratio controller could be biased by an amount equal to the estimated amount of air infiltration, this being checked by an analysis of the waste gases. The author agreed, provided the infiltrated air would remain constant for a reasonable length of time; his firm had used it on some

controllers. Waste gas analysis, however, did not show where the inlet of air occurred. Air-gas ratio control by direct measurement of the oxygen in the flue gases would result in a severe shortage of air blown through the checkers and up to the furnace port, the reduction being made up by cold air coming through the gaps round the doors.

Mr. W. J. Swinn (Honeywell & Brown, Ltd.) thought that the melter should be capable of adjusting the sequence to get maximum efficiency on reversal, leaving the day-to-day adjustment of air-gas ratio to the people at the furnace. The author replied that he was not in favour of furnacemen modifying the control systems. Suitable instruments were required to show the nature and value of the adjustments necessary to the air-gas ratio controller to get the optimum condition. Experiments were, however, being conducted with flame radiation measured by a high-speed recorder through each door of the furnace.

Mr. Storm (Electric Craft) said that his firm was at the present time investigating the use of thermocouples for roofs with a view to producing a refractory sheath which would stand up to open hearth conditions.

In reply to a query by Mr. F. Blezzard (Drayton Regulator & Instruments Co.) Mr. Whitehead said that good results could be obtained with the simple on-off type of control. Mr. J. F. Allen (Consett Iron Co., Ltd.) who asked about savings in fuel per ton of steel, was referred to the views expressed by melting-shop managers who presented papers at the 1950 Steel Making Conference of the British Iron and Steel Research Association and who all testified to having derived benefits from instrumentation.

Mr. A. Andrews (Elliott Bros. (London), Ltd.) said it was far more difficult for instrument makers to deal with very low pressures and very high temperatures if a simple thing like a furnace door could not be coped with. All manufacturers would shortly be getting round to the new thermocouples but needed the help of the user to try such things out. Users, manufacturers and furnace people should get together and not "pass the buck" to one another.

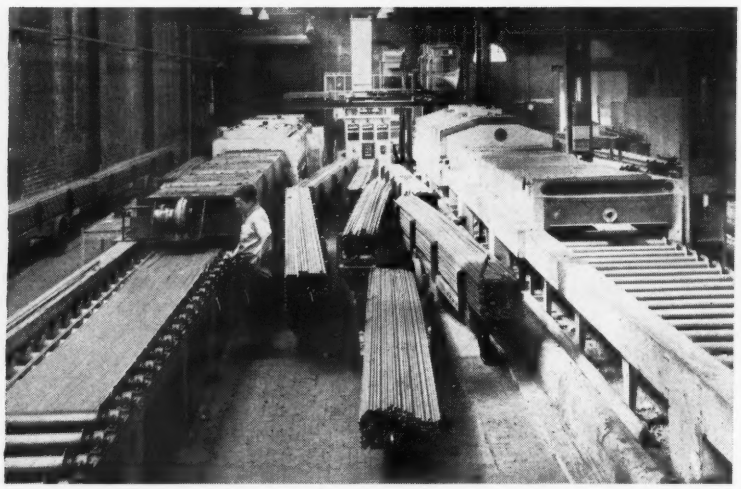
The chairman said that instrument makers should design instruments to suit the user and not necessarily expect the user to take such instruments as were offered.

Electric Roller Hearth Furnace

FOLLOWING a policy of re-equipment and expansion Yorkshire Copper Works, Ltd., Leeds, have recently put into production a new electrically heated roller hearth furnace for annealing brass tubes. The furnace was designed and installed by G.W.B. Furnaces, Ltd., and is designed to treat tubes from ¾in up to 6in dia, in lengths up to 28ft. An output of 30 cwt of tubes per hour at 650 deg C may be obtained with an electrical rating of 225 kW arranged in three independent automatically controlled zones, although the average output is normally 25 cwt/hr with a charge of 70/30 brass tube ¾in o/d by 16 g. Zones 1 and 2, where the initial heating up of the charge takes place, are rated at 85 kW, and zone 3 at 55 kW. The unit is fed from a three-phase supply, distributed equally across the phases, and heating elements in each zone are fed through tapped transformers to give reduced ratings when working in the lower temperature ranges, and when treating relatively light charges.

The heating chamber is 20ft long and of 3ft 9in usable width, suitable for accommodating charges up to 6in in height. The heating zones are 5ft long in zones 1 and 2, and 10ft long in zone 3. A water jacketed cooling chamber 23ft 6in long is fitted at the exit end of the heating portion of the furnace so that a gradual cooling of the charge is achieved, giving the desired mechanical properties. In order to obtain a degree of heat balance from one end of the unit to the other, and to cut down excessive end heat losses, an entrance vestibule 1ft 6in long is provided. Heating is by heavy nickel-chromium strip fitted in the roof and hearth of the heating chamber; the heating elements in the roof are carried on nickel-chromium hooks, while those in the hearth are supported on specially moulded refractories. For ease of internal maintenance and to enable any jams to be speedily released the lift-off roof of the heating chamber is removable in sections.

Temperature control is most critical in this process and three "Electroflo" electronic indicating controllers are provided, one for each zone, while a three-point recording instrument is also fitted in the control panel so that a positive visible check on thermal conditions throughout the process cycle may be obtained. The operating temperature of the furnace varies between 325-650 deg C, depending principally upon the type of charge and the degree of anneal required by the customer.



Electric roller hearth furnaces. The latest is on the right, the earlier installation on the left

Domestic Electrical Equipment

Hair Dryers

UNDOUBTEDLY one of the most popular items of domestic electrical equipment concerned with the toilet is the electric hair dryer, and its feminine appeal, for home shampooing and setting purposes, coupled with the fact that there is no alternative method of drying the hair so safely, quickly and efficiently, is largely responsible for the increased sale of this type of apparatus.

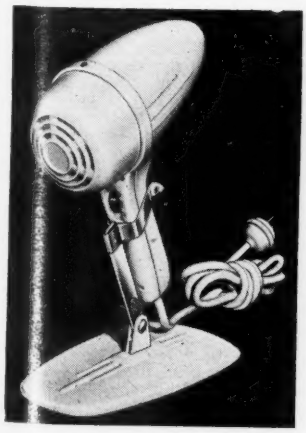
In addition to its obvious use this versatile appliance can also be adapted for a variety of everyday applications in the home, including the drying of small laundered articles, paintwork, etc. On an average the weight is in the region of 2 to 2½ lb although since our last survey on this subject a model weighing 1 lb has been introduced.

During the past few months changes have been made in the purchase tax relating to the stands; whereas these were previously free from tax, when purchased separately, they are now liable to payment.

Apart from hair dryers which are powered by a silent induction type motor, radio and television interference suppressors are refinements incorporated in many models, either as standard or as extras. Built-in mirrors are other special features.

A few hair dryers are designed for use on a.c. only, but most makes are suitable for either an a.c. or d.c. supply.

Manufacturer	Name or Model	Weight	Element Loading	Motor Loading	Special Features	Finish	Price (excl. P.T.)	Purchase Tax
CHARLES ALEXANDER & CO., LTD., 74, Portsmouth Road, Surbiton.	"Magicflow"	2¼ lb	500 W	50 W	Wide opening for air stream permits hair to be dried in "set" position	Cream with chromium fittings	£5 0 0	£0 18 9
BESTFRIEND ELECTRICAL CO., LTD., Diceland Works, Banstead, Surrey.	Model "A"	1¾ lb	400 W	30 W	—	Walnut or ivory Bakelite	£2 17 6 (walnut) £3 7 6 (ivory)	£0 10 9 (walnut) £0 12 8 (ivory)
	"Consort"	30 oz	400 W	30 W	Built-in mirror. Automatic switch	Walnut or ivory Bakelite	£3 12 6 (walnut) £3 19 6 (ivory)	£0 13 3 (walnut) £0 14 6 (ivory)
	"Permaster" Model "A" (a.c./d.c.) Model "B" (a.c.)	2 lb	400 W	30 W	For professional use. Rubber buffer strip. Switch fitted front or rear ("A"). Automatic switch ("B")	Polished chromium on copper. Bakelite handle	£4 7 6	£0 16 5
	"Mitey"	1 lb	350 W	30 W	Smallest and lightest. Complete in leatherette zipped wallet	Walnut or ivory Bakelite	£2 5 0 (walnut) £2 7 6 (ivory)	£0 8 3 (walnut) £0 8 8 (ivory)
BROWN BROTHERS, LTD., Great Eastern Street, London, E.C.2.	"Duco Boudoir"	3 lb 5 oz	500 W	50 W	Streamlined shockproof case. Stand 17s 6d extra plus 3s 2d P.T.	Walnut or peach Bakelite	£2 18 0 (walnut) £3 4 0 (peach)	£0 10 10 (walnut) £0 12 0 (peach)
BYLOCK ELECTRIC, LTD., 109, South Street, Enfield.	"Queen"	2½ lb	500 W	25–50 W	Stand 17s 6d extra plus 3s 2d P.T.	White Bakelite	£3 16 6	£0 14 0
	"Streamline"	2½ lb	500 W	25–50 W	Stand 17s 6d extra plus 3s 2d P.T.	Chromium body. Bakelite handle	£3 19 6	£0 14 6
	"Simoon"	2½ lb	500 W	25–50 W	Stand 17s 6d extra plus 3s 2d P.T.	Coloured Bakelite	£3 9 6	£0 12 8
	"Zephyr"	2½ lb	500 W	25–50 W	Stand 17s 6d extra plus 3s 2d P.T.	Sprayed metal body. Bakelite handle	£3 9 6	£0 12 8



Brown Brothers "Duco" hair dryer

Bestfrend "Consort" hair dryer

Bestfrend "Mitey" lightweight dryer

Bylock "Queen" hair dryer

Charles Alexander "Magicflow"

HAIR DRYERS . . . . . *continued*

Manufacturer	Name or Model	Weight	Element Loading	Motor Loading	Special Features	Finish	Price (excl. P.T.)	Purchase Tax
CO-OPERATIVE WHOLESALE SOCIETY, LTD., National Works, Hall Street, Dudley, Worcs.	"Minor"	2 lb 4 oz	400 W	50 W	—	Cream and black	£3 3 2	£0 11 10
ELECTROTHERMAL ENGINEERING, LTD., 270, Neville Road, London, E.7.	"Solis" 54	1¾ lb	400 W	—	A.c. only. Price includes stand	Ivory coloured plastic	£2 15 10	£0 10 5
	"Solis" 97	1½ lb	350 W	—	A.c./d.c. Lightness and compactness	Ivory coloured plastic	£3 6 4	£0 14 3
	"Solis" 99	1½ lb	210 W	—	A.c./d.c. Comb attachment for waving	Ivory coloured plastic	£6 17 9	£1 5 10
	"Solis" 105	1¾ lb	550 W	—	A.c./d.c. Mouth-piece for hair waving available	Ivory coloured plastic	£3 16 0	£0 14 3
	"Solis" 106	1¾ lb	750 W	—	A.c./d.c. Four-heat regulator	Ivory coloured plastic	£4 13 9	£0 17 7

Manufacturer	Name or Model	Weight	Element Loading	Motor Loading	Special Features	Finish	Price (excl. P.T.)	Purchase Tax
FRACTIONAL H.P. MOTORS, LTD., West Heath Works, Rookery Way, Hendon, N.W.9.	"Sylentflo"	2¾ lb	400 W	22 W	Radio and T.V. suppressor. Silent running	Walnut and ivory	£4 15 0 (walnut) £5 0 0 (ivory)	£0 17 10 (walnut) £0 18 9 (ivory)
JOHN A. FRANSEN, LTD., Northwood Hills, Middlesex.	"Forfex"	2 lb	700 W	80 W	Cold plus three-heat air control	Cream plastic	£7 9 9	£1 10 0
GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, London, W.C.2.	"D.M.395/6"	2 lb 2 oz	550 W	35 W	Radio and T.V. suppressor. Stand 16s extra plus 3s P.T.	Cream plastic	£4 4 0	£0 15 9
L. G. HAWKINS & CO., LTD., 30/35, Drury Lane, London, W.C.2.	"Supreme" L.G.H.95722	3¾ lb	550 W	—	Stand, 16s 6d extra plus 3s P.T.	Ivory Bakelite	£3 19 7	£0 14 7
HILLMAN ELECTRIC MOTORS, LTD., 2-3, Northwold Buildings, Northwold Road, N.16.	"Hillman"	1 lb 14 oz	500 W	25 W	Long nozzle. Shockproof casing	Ivory plastic	£3 3 0	£0 11 6
MORPHY-RICHARDS, LTD., 6, Conduit Street, London, W.1.	"H/1"	27 oz	400 W	20 W	Capacitor-induction motor. Heater fitted with safety cut-out	Ivory plastic	£2 14 6	£0 10 0
ORMOND ENGINEERING CO., LTD., Rosebery Avenue, London, E.C.1.	"E.1022"	3½ lb	500 W	50 W	Stand, mirror and comb	(A) Walnut or (B) Ivory	£2 18 0 (A) (in casket £4 3 0) £3 3 0 (B) (in casket £4 10 9)	£0 10 10 (A) (in casket £0 15 7) £0 11 10 (B) (in casket £0 17 0)
PIFCO, LTD., 36-37, Upper Thames Street, London, E.C.4.	"1050"	2 lb	500 W	50 W	Stand 17s 9d extra plus 3s 3d P.T. Case only £1 13 4 extra plus 12s 2d P.T.	Ivory	£3 3 0	£0 11 6
PYROVAC, LTD., 1, Queen's Terrace, Aberdeen.	"Pyrovac"	20 lb 8 oz	1 kW	150 W	Wall mounted. Coin operated	Black crackle paint. Chromium nozzle and attachments	£34 0 1	£3 9 11
SIROMA ENGINEERING CO., LTD., North Acton Road, Harlesden, N.W.10.	"H.D.2"	2½ lb	450 W	50 W	Stand 17s 6d extra plus 3s 2d P.T.	Walnut	£2 18 0	£0 10 7
	"H.D.3"	2½ lb	450 W	50 W	Stand 17s 6d extra plus 3s 2d P.T.	Peach	£3 4 0	£0 11 8

Engineering and Management

A THREE-DAY conference on the promotion of industrial engineering and management education at university level in European countries was held in Paris. It was organized by the Inter-University Contact for Management Education (I.U.C.) on behalf of the O.E.E.C. European Productivity Agency. The conference brought together about 80 participants from Austria, Belgium, Denmark, France, Germany, Italy, the Netherlands, Norway, Spain, Sweden, Switzerland, the United Kingdom, the United States and Yugoslavia, representing universities, institutes of technology, schools of business and other educational institutions at university level, Ministries of Education, as well as industry and business. Several international organizations interested in the field of management education were also represented.

The following were among the main subjects discussed: Objectives of university teaching in the field of industrial engineering and business management; present difficulties and obstacles in the way of providing adequate courses at university level in this field; the role of educational authorities in the promotion of education in this field; the role of industry in the promotion of this education; the role of research work for the establishment and strengthening of university-industry contacts; and university curricula.

The conference agreed that education and research in "Industrial Engineering and Management" at university level in most countries was not so far advanced as similar education and research in purely technical and economic subjects; and that there was still a considerable lack of understanding concerning the field of industrial engineering and management with regard to both its character and importance. That lack of understanding existed in university and industry alike.

Various recommendations were made, including the following: Further steps should be taken to develop mutual co-operation between universities and industry in the field in question; it was the responsibility of educational institutions at university level to organize education in the sphere of industrial engineering and management and it was essential that this should be done in close contact with industry; measures should be taken by the appropriate authorities or by leaders of industry to encourage the founding of or to endow chairs and departments in the field in all appropriate university level institutions in Europe; and all professors and teachers should take part in this type of interchange at a national and international level.

GENERATION AND DEVELOPMENT

Six Months' Output

During the first half of the year 41,033 million kWh was generated by the Central Electricity Authority, the North of Scotland Hydro-Electric Board and the South of Scotland Electricity Board. The rate of increase of 11·8 per cent compares with 10·7 per cent in the first half of 1954. At the end of last month the total installed capacity was 21,067 MW, a net increase of 400 MW since the beginning of the year; this was slightly more than in the first six months of 1954, when a total of 351 MW was added.

ELECTRICITY GENERATED AND PLANT INSTALLED*

	Fuel consumed Thousand tons			kWh generated Millions			kWh sent out Millions	Installed capacity (m.c.r.) MW
	Coal	Coke and Breeze	Oil	Steam	Water power	Total†		
Central Electricity Authority ...	2,745	72	13·6	5,162	5	5,174	4,846	19,186
North of Scotland H.E.B. ...	25	—	1·1	39	59	103	101	629
South of Scotland E.B.	194	5	0·1	351	8	359	340	1,252
Total for June, 1955	2,964	77	14·8	5,552	72	5,636	5,287	21,067
Corres. total for June, 1954 ...	2,712	77	8·4	4,996	84	5,090	4,774	19,520
Inc. or dec., per cent	+9·3	—	+76·2	+11·1	−14·3	+10·7	+10·7	+7·9
Total to date (6 months) 1955 ...	21,486	608	125·6	40,250	697	41,033	38,604	
Total for corres. 6 months of 1954	19,594	589	73·9	35,923	701	36,698	34,518	
Inc. or dec., per cent	+9·7	+3·2	+70·0	+12·0	−0·6	+11·8	+11·8	

* Comprising all generating stations controlled by the Central Electricity Authority, the North of Scotland Hydro-Electric Board, and the South of Scotland Electricity Board.

† Including generation by other methods amounting to 12 million kWh.

South Wales Programme

Full details of the South Wales Electricity Board's programme of capital works to be carried out in the current financial year were given to the Consultative Council last week. The programme will involve a total expenditure of £5,300,000. This includes £1,640,000 on works to afford supplies to industry, commerce, new houses and public lighting, etc.; £1,600,000 on reinforcement works; £1,300,000 on works in rural areas; £400,000 on the change-over of d.c. and non-standard a.c. supplies (as a result of this expenditure the number of d.c. supplies in South Wales should be reduced to insignificant proportions by the end of the year); and £350,000 on providing additional points of bulk supply.

In 1954-55 expenditure amounted to nearly £5,000,000. The extent of the current programme may be measured against the capital expenditure of approximately £2,500,000 which the Board incurred in 1952-53.

Service Centre Floor Warming Installation

Parties of architects from local authorities and private architects from various parts of the South West visited Exeter last week to see the first example in the West Country of the latest method of warming buildings by radiating heat from the floor.

The installation is at the South Western Electricity Board's new service centre in Bedford Street, Exeter. The floor is now being laid, and the visiting architects were able to see some of the heating cables in position.

The installation covers a floor area of 3,000 sq ft and has a total loading of 29·85 kW. It is designed to maintain an internal temperature of 55 deg F against an outside temperature of 30 deg F with normal ventilation throughout. The electrical intake will be restricted to the following hours:—Weekdays: 7 p.m. to 7 a.m. with, if necessary, a brief mid-day "boost." Week-end: 7 p.m. Sundays to 7 a.m. Mondays. It is estimated that the annual consumption of energy during the normal heating period will be approximately 41,000 kWh. On one of the Board's appropriate off-peak rates the estimated annual running cost of this installation would be £163 or 1s 1d/sq ft per annum.

This concealed heating system will enable the Electricity Board to use all the showroom space for display purposes and cash and inquiry desks.

Rural Switch-On

On 6th July in the village of Blackham, on the Kent and Sussex border, an exhibition of electrical equipment both for the farm and home was opened to mark the switching-on of an electricity supply. Mr. N. Boydell, manager of the East Sussex and S.W. Kent Sub-Area of the South Eastern Electricity Board (who was introduced by Mr. T. W. Dann, manager of the Tunbridge Wells District) recalled the history of the negotiations that had taken place over the years so that electricity could be brought to the village. On the following day cooking and home laundry demonstrations were given by the Board's staff, together with film shows.

C.E.A. Contracts

Contracts have been placed by the Central Electricity Authority during the past month for power stations, transforming stations and transmission lines amounting in the aggregate to £16,647,000. The principal contracts include:—

Acton Lane power station, Willesden.—Demolition and foundations.—Sir Robert McAlpine & Sons, Ltd.

Belvedere power station.—Main foundations, underbuilding and associated works.—John Mowlem & Co., Ltd. Two 7,500 kVA station transformers.—Hackbridge & Hewittic Electric Co., Ltd.

Marchwood power station, near Southampton.—Two 550,000 lb/hr boilers.—John Thompson Water Tube Boilers, Ltd.

Poole power station.—Foundations.—George Wimpey & Co., Ltd.

Portishead "B" power station, near Bristol.—Ash and dust handling plant.—John Thompson Industrial Construction, Ltd.

Goldington power station, Bedford.—Steel frame for turbine house and boiler house buildings.—John Booth & Sons (Bolton), Ltd.

Little Barford "B" power station, near St. Neots.—Two 60,000 kW turbo-generators, feed water heating and condensing plants and one 72 MVA, 141·6/11·8 kV generator transformer.—C. A. Parsons & Co., Ltd. Two 550,000 lb/hr boilers.—Foster Wheeler, Ltd.

Castle Donington power station, near Derby.—One cooling tower.—Mitchell Construction Co.

Drakelow "B" power station, Burton-on-Trent.—One 120,000 kW reheat turbo-generator, feed water heating and evaporating plant, condensing plant and auxiliary apparatus.—C. A. Parsons & Co., Ltd.

Staythorpe "B" power station, Newark.—Two 60,000 kW turbo-generators and feed heating plant.—Metropolitan-Vickers Electrical Co., Ltd. One 60,000 kW turbo-generator.—General Electric Co., Ltd. Condensing plant for three 60,000 kW turbo-generator sets and feed heating plant for one set.—Worthington-Simpson, Ltd.

Willington "A" power station, near Derby.—Two reinforced concrete chimneys.—Tileman & Co., Ltd.

Ocker Hill power station, Tipton, Staffs.—Main building and superstructure.—Sir Alfred McAlpine & Son, Ltd.

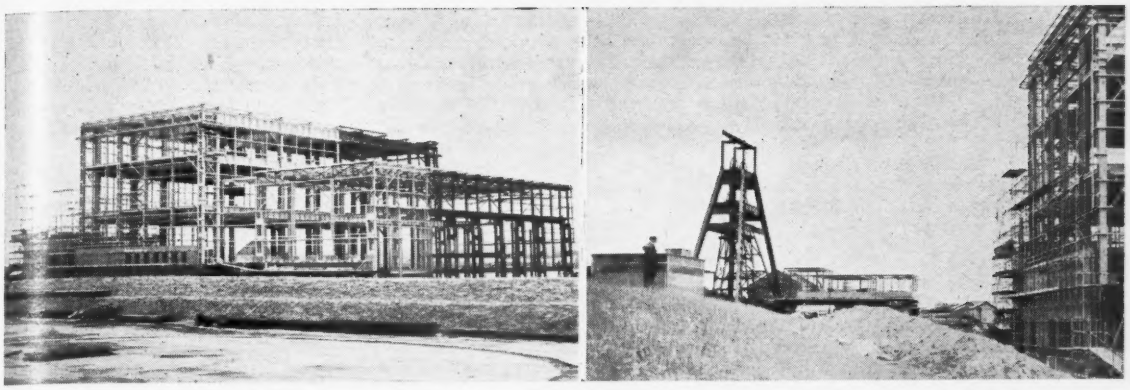
Skelton Grange "B" power station, Leeds.—Boiler feed pumps.—Sulzer Bros. (London), Ltd.

West Weybridge substation.—132 kV switchgear.—Reyrolle & Co., Ltd.

Cardiff West-Pyle/Ebbw Vale.—132 kV overhead lines.—J. L. Eve Construction Co., Ltd.

Slurry-Burning Power Station

One of two experimental power stations being built in Britain by the Central Electricity Authority in collaboration with the National Coal Board is at the Barony Colliery, Auchinleck, in the Ayrshire Coalfield. Like its counterpart at Grimethorpe in Yorkshire, it is designed to generate power by burning colliery waste, or slurry. The accompanying photographs show the experimental power station, the first of its kind in Britain or America, which will have a capacity of 60,000 kW. To the left is seen



View of the power station under construction at Barony Colliery, Auchinleck, Ayrshire, for burning slurry, and (right) the new surface buildings

No. 3 shaft's new headgear which is capable of hauling four cages simultaneously. Round it are grouped the new surface buildings including, on the extreme left, a modern winding house which will replace the one at present in use. The power station will be fitted with specially designed furnaces for burning the slurry and with special machinery for drying and pulverizing it. The slurry will come from the Barony Pit and from nearby Killoch Pit.

Kariba Power Scheme

The Federal Hydro-Electric Board of Rhodesia and Nyasaland has appointed Messrs. Merz & McLellan as electrical and mechanical engineers for the Kariba Gorge scheme on the Zambesi, the contract for the preliminary civil engineering work for which has been awarded to the Cementation Co., Ltd., Doncaster. Sir John Hacking, consultant with Messrs. Merz & McLellan and former deputy chairman (operations), Central Electricity Authority, is to advise the Federal Government on electricity legislation and the co-ordination of electricity supplies.

Rural Progress in the North East

A report indicating the progress made in providing supplies to rural areas was submitted to the North Eastern Electricity Consultative Council on Monday. This showed that at 31st March last 1,262 of the 1,305 villages and hamlets in the Electricity Board's area had been connected. Work was in hand on supplies to a further twenty-four and negotiations were proceeding in connection with the remaining nineteen.

There are approximately 18,000 farms in the Board's area of which 8,650 had been connected at the end of March. During 1954-55 a record number of 1,483 received a supply and this year a further 1,750 are expected to be served.

Expenditure on rural development has risen from £230,000 in 1948-49 to £719,147 in 1954-55 and in its budget for the current year the Board has included a sum of £974,000.

Electricity Charges to be Raised

After a special conference with the chairmen of the Electricity Boards on the subject of the "severe increase in coal prices" the Central Electricity Authority last week issued a statement in which it said that it had been reluctantly decided to raise electricity charges. Area Boards were to submit proposals to this effect and although the increases would not be uniform over all areas because of the varying incidence of the extra costs and the different tariff structures, they would, except in special circumstances, take effect from the beginning of October.

It was pointed out that in a period of continually rising costs of coal, wages, transport and all other things used by industry, the average revenue received per kWh was only about 30 per cent more than before the war. Surpluses had been earned every year since the industry was nationalized, but they were modest in comparison with the scale of operations. They must be maintained and increased if financial stability was to be assured and more money provided to finance the continuing expansion of the industry.

There had been recent increases of £9 million a year in wages and salaries and £3,500,000 in freight charges, in addition to increased capital charges. It had been hoped that the industry could carry these increases without having to raise prices generally, but the coal price increase of some £20 million in a full year made this impossible. The coal increase alone would not only wipe out the surpluses but would lead to deficits.

Commenting on the increase in coal prices at a meeting of the Electricity Consultative Council at Exeter, Mr. S. F. Steward, chairman of the **South Western Electricity Board,** said, "Coal is becoming more and more precious and its scarcity value underlines more than ever before the need for going ahead with electrical development in the West Country, with its population centres remote from the main coalfields." More than ever before it would pay householders, and serve the national interest, if electricity was used for summer water-heating and the all too precious solid fuel preserved against winter necessity. The increase in coal prices, which would add over £500,000 to the Board's costs in a full year, had come as a heavy blow. Improved working efficiency, together with the rising demand for electricity, had enabled the Board to absorb earlier coal price increases without raising tariffs. But the magnitude of the latest increase would make some tariff increase inescapable. It was too early to make a definite statement, but he had good hope that the Board would be in a position to leave unchanged the running rate of 1d/kWh which made summer-time water heating by electricity so economical.

Mr. C. T. Melling, C.B.E., chairman of the **Eastern Electricity Board,** recalled that the Board had increased its tariffs on 1st April this year. Allowance had been made for a probable increase in the price of coal and even though the actual increase was much higher than expected he hoped to satisfy the Central Electricity Authority that there was no need for a further general increase in the Eastern Board's tariffs at the present time.

The **Douglas (I.O.M.) Corporation Electricity Department** on Monday decided not to pass on the increase in coal prices to its consumers.

Financial Section

STOCKS and SHARES

INDUSTRIAL markets of the Stock Exchange hesitated only momentarily over the increase in coal prices and the strike-affected overseas trade figures. Within a few days, the share-price indices had broken the altitude record yet again. Holiday influences and other distractions have had some effect in reducing market activity. The course of prices, however, has continued to show nothing more serious than an occasional bout of irregularity. In these propitious circumstances, new issue activity increases. Several public offers of shares have been made with success. Among the "rights" issues, the premium on Telegraph Construction & Maintenance new shares improved to 2s 9d on the issue price of 32s 6d.

Higher Prices

G.E.C. rose further to 71s 3d in advance of the final dividend due to be declared on Thursday of this week. English Electrics, Parsons and Reyrolles were, as usual, well to the fore. Murex repeated the previous week's advance of about 3s, and Hackbridge Cables also added to recent gains. Improvements of half-a-crown were marked in Aron Meters, Desoutter, Midland Electrics and Tube Investments. Other notably firm spots were Veritys, Mather & Platt, Dewhurst and Dictographs.

Bowthorpe Offer

Last week's offer of 550,000 ordinary shares of 2s in Bowthorpe Holdings at 8s 9d was over-subscribed to the extent that a ballot had to be used for public applications up to 1,500 shares. Dealings began on Monday of this week at a premium of 10s 3d, rising rapidly to 12s. Assuming profits this year at not less than the 1954 level, the directors expect to be able to recommend dividends totalling 35 per cent. On the same assumption, that rate would be covered about three times over by the profits available for distribution. At the opening market price the prospective yield on the shares works out at 5⅝ per cent.

Earnings Prospect

Products of the operating companies in the Bowthorpe Holdings group are said in the prospectus to be sold, in the main, to the Central Electricity Authority, to electricity undertakings abroad and to the electrical, electronic, radio, television, aircraft and motor industries, for all of which the prospects are regarded as encouraging. Average turnover of the group for the first five months of this year exceeded last year's monthly average. Since the formation of the present holding company in 1949, the business has been in the process of vigorous expansion, the results of which are to be seen in the rise in group profits over this period from £102,000 to £458,000 (before tax) in 1954. Issued capital of the company totals £337,500, of which £300,000 is in ordinary and the small remainder in preference shares.

The Week's Price Changes

Company or Board	Nom. Value	Middle price 18th July	Week's Rise or Fall	Dividend Previous	Dividend Last	Yield %	1955 Highest	1955 Lowest
Gilt-edged Stocks						£ s d		
Brit. Elec. 1968/73	100	84½		3	3	3 11 0	94¾	83½
Brit. Elec. 1974/77	100	83½	−1	3	3	3 11 9	93⅝	83½
Brit. Elec. 1976/79	100	88½		3½	3½	3 19 0	98⅛	87½
Brit. Elec. 1974/79	100	100½		4½	4½	4 5 6	109	99½
Overseas Electric Supply								
Calcutta Elec.	£1	22/-	+6d	6†	6†	5 9 0	22/6	20/9
East African Power	£1	24/6	+1/-	7	7	5 14 3	24/6	19/9
Nigerian Elec.	£1	24/6		10	10	8 3 3	27/-	22/6
Palestine Elec. "A"	£1	21/-		Nil	Nil	—	22/9	21/-
Perak Hydro-Elec.	£1	21/6	+6d	6	10	9 6 0	21/6	17/9
Equipment and Manufacturing								
Aberdare Cables	5/-	14/3		12½	17½	6 2 9	14/6	11/-
Aerialite	1/-	5/9		88½	88½	—	6/7	5/3
Allen, W. H.	£1	83/9		20	20	4 15 6	83/9	77/-
Aron Elec. Ord.	£1	61/3	+2/6	20	15	4 18 0	63/9	55/6
Assoc. Elec. Ord.	£1	95/-	+5/-	11½	14	2 19 0	96/-	65/3
Automatic Tel. & El.	£1	78/3		15	15	3 16 9	79/6	69/-
Babcock & Wilcox	£1	95/6		12*	15	3 2 9	98/-	68/6
Baldwin, H. J.	2/-	5/6		20	20	7 5 6	5/6	4/4
Bakelite	10/-	33/6		12½	16	4 15 6	33/6	27/-
British Aluminium	£1	54/-		10	12	4 9 0	54/-	35/3
B.I. Callender's	£1	55/-		10	10	3 12 9	55/3	44/9
B.I. Callender's 6% Pref. ...	£1	23/6	+6d	6	6	5 2 3	26/6	23/-
British Thermostat	5/-	35/-	+1/3	27½	27½	3 18 6	35/-	22/6
British Vac. Cleaner	5/-	10/-		25	30	—	10/-	7/-
Brook Motors	10/-	45/-		20	20*	—	45/-	39/9
Brush Ord.	5/-	9/3		6	10	5 8 0	9/6	7/7
Bulgin, A. F.	1/-	8/-		30	45	5 12 6	8/-	4/-
Burco	5/-	18/9		35	25*	6 13 3	23/-	18/9
Chloride El. Storage "A" ...	£1	77/6	+6d	12½	17½	4 10 4	77/6	58/6
Clarke Chapman	£1	102/6		20	20*	3 18 1	102/6	68/9
Cole, E. K.	5/-	23/6	+1/-	27½	17½*	3 14 6	24/9	18/3
Cossor, A. C.	5/-	12/6	+3d	10	10	4 0 0	13/-	8/9
Crabtree	10/-	33/-	+6d	17½	20	6 1 3	34/6	29/3
Crompton Parkinson Ord. ...	5/-	19/-	+3d	20	20	—	19/9	16/-
De La Rue	5/-	20/9	−1/-	20	30	7 4 7	26/-	18/9
Decca	4/-	45/-	−2/6	35	56½*	—	48/9	31/-
Desoutter	5/-	35/-	+2/6	20	25	3 11 6	35/-	25/6
Dewhurst	2/-	10/6	+6d	19	24	4 11 6	10/6	7/3
Dictograph Tel.	2/-	7/6	+3d	20	20	5 6 9	7/6	6/6
Dubilier Condenser	1/-	5/-		25	25*	5 0 0	5/7	3/10
E.M.I.	10/-	30/6	−6d	8	10	3 5 6	37/-	25/3
Electrical Components	5/-	18/9		20	20	5 6 8	18/9	15/3
Elec. Construction	£1	35/9		15	8½*	4 15 0	41/3	31/6
Enfield Cable Ord.	£1	20/-		Nil	Nil	Nil	25/3	20/-
English Electric	£1	82/6	+2/6	10	12½	3 0 6	82/6	54/3
English Electric 3¾% Pref. ...	£1	14/9		3¾	3¾	5 1 9	16/9	14/9
Ericsson Tel.	5/-	44/6	−6d	25†	20†*	2 5 0†	46/6	29/-
Ever Ready	5/-	38/-	+6d	40	35*	4 12 0	38/-	22/3
Falk Stadelmann	£1	50/6	−2/-	15	15	5 18 9	52/6	43/9
G.E.C. Ord.	£1	71/3	+1/3	11½	12½	3 10 3	71/3	51/3
G.E.C. 6½% Pref.	£1	25/-		6½	6½	5 4 0	28/4	23/6
General Cables	5/-	15/-		30	30	10 0 0	17/-	15/-
Greenwood & Batley	£1	56/9		17½	17½	6 3 3	57/-	54/6
Hackbridge Cable	5/-	22/-	+9d	20	20	4 11 0	22/6	14/-
Hackbridge & Hewittic	5/-	33/9		25	30	4 9 0	33/9	23/9
Hall Tel. Acc.	10/-	21/-	−6d	10	10	4 15 3	22/6	11/-
Heatrae	2/-	5/9		12½	15	5 4 4	5/9	4/2
Henley's	10/-	21/3		10½	10½	4 18 9	21/3	17/-
Holophane...	5/-	17/6		20	25	7 2 9	19/9	16/-

* After scrip issue. † Free of income tax.

The above quotations are based upon middle prices in the Stock Exchange Daily Official List.

The chairman of Scottish Cables reported that the company's year had begun with full order books, and, in the absence of prolonged industrial disputes and other untoward incidents, he was confident of further satisfactory results. He reviewed a year in which the net profit of £167,000 had only once been surpassed. Earnings work out at the equivalent of 48 per cent on the ordinary shares, which receive a second successive dividend of 27½ per cent. Regarding prospects for Engineering & Lighting Equipment, the chairman of that company says that although the order book is not overflowing as it was until recently, the business continues to flourish at a high level, and with growing efficiency. The dividend for the year represents a total of 21 per cent on the present capital (enlarged by a scrip issue) and is covered four times over by net profits. Yield on the 2s shares at 6s is 7 per cent.

in Electrical Investments

Company or Board	Nom. Value	Middle price 18th July	Week's Rise or Fall	Dividend Previous	Dividend Last	Yield % £ s d	1955 Highest	1955 Lowest
Equipment and Manufacturing—continued.								
Hoover	5/-	51/6	+1/-	45	70	7 0 0	52/6	40/-
I.C.I.	£1	56/3	−6d	15	10*	3 11 0	61/9	38/3
Intl. Combustion	5/-	23/-	−1/-	20	25	—	24/6	16/3
Johnson & Phillips	£1	43/9	−1/3	15	15	6 17 3	52/6	43/9
Lancashire Dynamo	£1	55/-		14	15	—	55/3	37/3
Laurence, Scott	5/-	19/6		20	12½*	3 4 0	19/6	14/6
Lister, R. A.	£1	39/-	−1/-	12	9·3*	4 15 3	40/-	30/6
London Elec. Wire	£1	61/3		10	12½	4 1 9	61/3	50/6
Lucas, J.	£1	49/6	−6d	10·8	7½*	3 0 6	50/6	41/6
Marryat & Scott	2/-	12/3		25	30	4 18 0	13/-	9/6
Mather & Platt	£1	70/6	+2/-	15	13·4*	3 16 0	70/6	48/-
Metal Industries	£1	35/6	−1/6	12	9	5 1 6	38/-	30/-
Midland Elec. Mfg.	£1	55/-	+2/6	15	10*	3 12 9	55/-	44/-
Morphy-Richards	4/-	33/9		40	35*	4 3 0	35/-	27/-
Murex	£1	66/-	+3/-	15	15	4 11 0	66/-	49/3
Newman Ind.	2/-	2/9		10	10	7 5 6	3/6	2/4
Oldham & Son	1/-	4/-		17½	20	5 0 0	4/-	2/10
Parnall (Yate)	5/-	11/3		8	14	6 4 6	13/2	7/3
Parsons, C. A.	£1	92/6		7½	10	2 3 3	100/-	56/-
Plessey	10/-	82/6		30	20*	2 8 6	82/6	57/6
Pye Deferred	5/-	38/9	−9d	20	20*	2 11 6	40/6	28/6
Revo	10/-	15/6		27½	9*	5 16 3	15/6	12/6
Reyrolle	£1	122/6	+2/6	13½	15	2 9 0	126/-	89/-
Rheostatic	4/-	14/3		20	22½	—	14/3	9/3
Richardsons Westgarth	5/-	18/-	+1/-	15	15*	4 3 3	18/-	11/-
Scottish Cables	4/-	20/-		27½	27½	5 10 0	22/6	19/3
Smith (England), S.	4/-	18/6	−9d	15	17½	3 15 9	20/-	15/-
Southern Areas	£1	37/6	+4/6	7½	10	5 6 9	37/6	27/6
Strand Elec.	5/-	10/3		17½	17½	8 10 9	10/3	8/6
Sturtevant	5/-	35/6		18·9	14·4†*	2 0 9†	35/9	21/-
Sun. Elec.	£1	35/-		15	15	8 11 6	35/-	33/9
Switchgear & Cowans	5/-	17/-		10	20	5 17 9	17/-	11/-
Taylor Tunnicliff	5/-	16/3	+6d	12½	15	4 12 3	16/3	11/3
T.C.C.	10/-	51/3		30	25*	4 17 6	51/3	41/-
T.C. & M.	£1	35/-		8½	8½	4 17 3	40/9	35/-
Telephone Mfg.	5/-	10/6		10	10	4 15 3	10/6	9/3
Thorn Elec.	5/-	26/3		20	15*	2 17 3	33/-	13/9
Thornycroft	£1	45/-		15	15	—	45/-	34/6
Tube Investments	£1	97/6	+2/6	15	17½	3 11 9	98/6	72/6
Vactric	5/-	21/3	+1/3	10	15*	3 10 7	22/-	12/-
Veritys	5/-	10/6	+1/3	12½	12½	5 19 0	10/6	7/-
Walsall Conduits	4/-	66/3		70	70	4 4 6	66/3	50/-
Ward & Goldstone	5/-	41/3	−9d	50	30*	3 12 9	45/-	37/6
Watford	2/-	8/9		22½	25	5 14 3	8/9	6/3
Westinghouse Brake	£1	108/9	−1/3	16	18	3 6 3	110/-	82/-
West, Allen	5/-	16/6		17½	15*	4 11 0	16/6	8/-
Wolf Electric	5/-	21/-		17½	20	4 15 3	21/-	16/1
Trusts, Transport and Communications								
Anglo-Am Tel.:								
A. Ord.	100	75½		6	6	7 19 0	88	75½
Ord.	100	50		3¾	3¾	7 17 6	54½	50/-
Anglo-Portuguese	£1	26/-	+1/-	8	8	6 3 0	26/-	21/-
Brit. Elec. Traction:								
Def. Ord.	5/-	23/6		50	22½*	4 17 9	24/3	19/6
Cable & Wireless:								
Ord.	£1	54/-	+1/-	9	10	3 14 0	54/-	39/6
4% Loan	100	94½	+1	4	4	4 5 6	100	92
Calcutta Trams	£1	22/6		2½†	6†	5 6 8†	25/-	20/-
Cape Elec. Trams	£1	18/-		5½	7½	8 6 8	18/-	16/6
Marconi Marine	£1	41/3		10	10	4 17 0	41/3	33/-
Oriental Tel. Ord.	£1	85/-		16	16	—	102/6	96/6
Telephone Props.	£1	98/9		—	20	4 0 9	98/9	80/6
Telephone Rentals	5/-	13/6		10	12½	4 12 6	13/6	9/6

A.E.I. Capital

Associated Electrical Industries £1 ordinary were among the shares to reach a new high level, being dealt in up to 95s 6d. The authorized capital of the company requires to be raised by rather more than a million in connection with the acquisition of Siemens 10 per cent preference stock. The opportunity is to be taken to create a reserve of unissued shares by the creation of £7 million additional capital. There is no present intention of making a new issue, but no doubt the need to do so will arise at later stages of the group's expansion plans. The yield on the shares has come down to a bare £2 19s per cent, which marks them as one of the top favourites in that classification of shares popularly known nowadays as " growth " stocks.

Sun Electrical Interim

Sun Electrical depart from their usual custom in declaring a 5 per cent interim dividend on account of the year ended last April. For many years the practice has been to make single annual payments, the most recent of which was announced in November. On the last four occasions the rate has been 15 per cent, and the earnings available for distribution in the period 1953-54 represented 27 per cent on the £93,300 ordinary capital. It is comparatively seldom that dealings in the £1 shares are recorded. After the interim declaration the shares were called in the market 36s 3d, which is 1s 3d above the official list quotation. In the annual report, issued at the end of last year, turnover was said to be showing a considerable increase.

British Electricity Stocks

British Electricity stock prices have recovered recently a little of the heavy depreciation suffered since the increase in the Bank Rate early in the year. Much of that weakness has been ascribed to the selling of gilt-edged holdings by the banks in order to provide for their persistently high level of loans and advances to industry, and to the nationalized undertakings in particular. The issue of £100 million British Gas stock last week is calculated to bring relief in that respect, and it would surprise no one if the Central Electricity Authority followed suit by coming to the market soon for a long-term loan to replace their multi-millions of temporary borrowings.

REPORTS and DIVIDENDS

Simon-Carves, Ltd.—The accounts for 1954 show a consolidated trading profit of £1,102,432, as compared with £616,112 for the preceding year, and after meeting all charges, including £498,049 for taxation, the net balance is £434,954 (against £138,025). After various adjustments, the net profit dealt with in the accounts of the parent company is £447,850 (£208,784). It is proposed to pay a final dividend of 10 per cent, making with the two interim dividends each of 10 per cent, a total of 30 per cent for the year (against 20 per cent). The second interim dividend and the final distribution are paid on capital increased to £524,958 by the issue in December last of 47,723 ordinary £1 shares by way of capitalization of reserves. Reserves receive £205,000 and the balance carried forward is £441,469 (against £331,648 brought in).

In his statement which accompanies the report and accounts, Lord Simon (chairman) says that the results for 1954 are easily a record for the company. Work carried out approached £16 million, and there are indications that this figure may be exceeded in the current year. The order book at the present time is of such proportions that all the resources of the company should be fully occupied for at least four years. Competition is becoming keener and is particularly difficult in the export field, which represents approximately 20 per cent of the business. The Power Plant Department is in the middle of a large programme of high-pressure water-tube boiler construction for power stations, mainly for the C.E.A. It is also responsible for important installations in Australia. The South African subsidiary has completed a number of coal handling plants for power stations.

With regard to research and development, they are keenly interested in developing a plant to produce smokeless fuel, and they are working on plant to remove sulphur from power station flue gases.

Referring to nuclear power, the chairman says that in partnership with the General Electric Co., Ltd., they have formed a study-group on the application of nuclear energy for power production; three similar groups have been formed by other boiler-making and electrical engineering concerns in Britain, and it is hoped that in the years ahead they will derive concrete benefit from the substantial expenditure they are incurring by obtaining business both in Britain and abroad.

Pinchin, Johnson & Associates, Ltd.—The combined profits for the year to 31st March last are £2,205,122, as compared with £1,876,779 for the preceding year, and after deducting taxation, the net balance is £825,513 (against £695,026), of which the parent company's proportion is £659,313 (£551,180). A final dividend is recommended of 17½ per cent, maintaining the distribution for the year at 25 per cent. It is also proposed to make a 50 per cent scrip issue which will involve the capitalization of £1,314,900 from share premium account. The issue is subject to the consent of the Capital Issues Committee.

George Cohen, Sons & Co., Ltd.—The preliminary statement for the year ended 31st March last shows group profits of £1,417,417, as compared with £1,214,536 for 1953-54. After meeting all charges, including £771,257 for taxation, the net profit is £646,160 (against £340,582) of which £642,695 is attributable to the holding company. It is proposed to pay a final ordinary dividend of 11½ per cent, making 15 per cent for the year (against 12 per cent). General reserve of the parent company receives £254,623, and the general reserves of subsidiaries £78,465.

Associated Electrical Industries, Ltd.—In a letter to stockholders, Lord Chandos (chairman) outlines proposals to create a balance of unissued shares. He says that to give effect to the recent offer to acquire the 10 per cent preference stock of Siemens Brothers and Co., Ltd., A.E.I. authorized capital must be increased by at least £1,100,000. The board proposes to create £7 million of new capital of which £5·9 million in unclassified shares will remain after the Siemens acquisition. There is no present intention of making a further issue of shares. Resolutions are to be submitted to an extraordinary meeting on 9th August.

George Kent, Ltd.—The profit of the parent company for the year to 26th March last, after providing for taxation, is £206,850, as compared with £149,414 for the previous year. Group profits were £180,099 (against £107,899). It is proposed to pay a final dividend of 12 per cent, making 15 per cent for the year (against 12½ per cent).

The Sun Electrical Co., Ltd., has declared an interim dividend of 5 per cent. No interim payment was made last year but the dividend for the year was 15 per cent.

New Companies

A. T. Snowden (Luton), Ltd.—Registered 27th May. Capital £10,000. Radio, television, electrical, telecommunication and mechanical engineers, etc. Directors: K. F. Jackson, Mrs. Gladys M. Jackson, R. A. K. Coe and Mrs. Ruby J. Coe. Regd. office: 171, Dunstable Road, Luton.

Pinnacle Electronic Products, Ltd.—Registered 1st June. Capital £10,000. Manufacturers of and dealers in radio, radar, television, telecommunication and electronic apparatus, etc. Directors: F. D. Pratt and D. M. S. Toms. Solicitor: Alastair Thomson, 5, Piper Buildings, Temple, E.C.4.

M. S. Deeks (Electrical Contractors), Ltd.—Registered 31st May. Capital £300. Directors: M. S. Deeks and Mrs. Joyce L. Deeks, both of The Bright Star, Peters Green, Luton.

John Charnley, Ltd.—Registered 31st May. Capital £1,000. To acquire the business of an electrical engineer and general electrical installation contractor heretofore carried on by J. Charnley at 24, Cedar Road, Preston. Directors: J. Charnley, C. Baines, P. A. Baines and A. G. Robertson. Regd. office: 26, Winckley Square, Preston.

Loma Metal Detectors, Ltd.—Registered 20th June. Capital £100. Retailers of mechanical and electronic equipment and general electrical engineers, etc. Directors: T. H. Oakman and T. Y. Logan. Secretary: Doris A. Oakman.

N.W. Electrical Co., Ltd.—Registered 20th June. Capital £100. Repairers and installers of electrical and lighting equipment for illumination and other purposes, manufacturers of and dealers in electric lamps and valves, cathode ray tubes and all accessories used in the electrical, radio and television trades, etc. B. Barnett is the first director. Secretary: Pearl Freeman. Regd. office: 374, Old Street, E.C.1.

Lawrence Lee, Ltd.—Registered 28th June. Capital £2,000. To acquire the business of an electrical contractor carried on by Lawrence Lee at 8, Red Bank Road, Bispham, Blackpool. Directors: L. Lee (chairman) and Mrs. Edith Lee, both of 12, Beaucroft Avenue, Blackpool.

B-J. & W. Automation, Ltd.—Registered 20th May. Capital £100. Manufacturers of and dealers in electrical, mechanical, cinematographic, photographic, radio, television and radio apparatus and equipment, etc. Directors: W. H. Berriedale-Johnson and C. D. Sparks. Regd. office: Argyle House, 29-31, Euston Road, N.W.1.

Webcor (Great Britain), Ltd.—Registered 24th May. Capital £1,000. Manufacturers, sellers, importers and exporters of mechanical and electrical equipment and components for recording and reproducing sound, radio and electronic apparatus, etc. Solicitors: Piesse & Sons, 73, Cheapside, E.C.2.

Cantor Electrical Co., Ltd.—Registered 11th June. Capital £1,000. To acquire the business of electrical engineering carried on by C. K. Hefferman as the Cantor Electrical Co. Directors: T. M. Hefferman, R. A. Morsman and T. E. North. Regd. office: 61, Carey Street, W.C.2.

Burke Electrical Services (London), Ltd.—Registered 10th June. Capital £100. Manufacturers of electrical goods of all kinds, etc. The first

(*Continued on page 183*)

MARTINDALE
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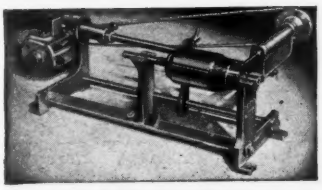
AERO-AUTO



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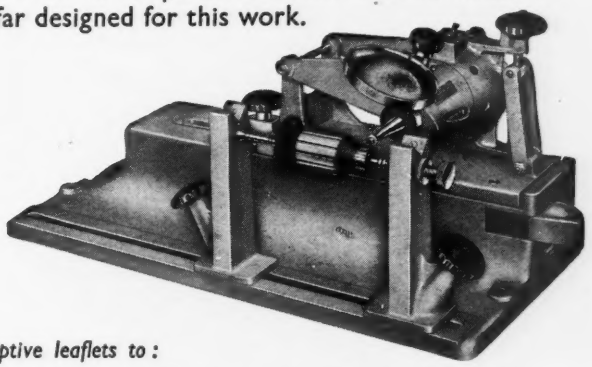

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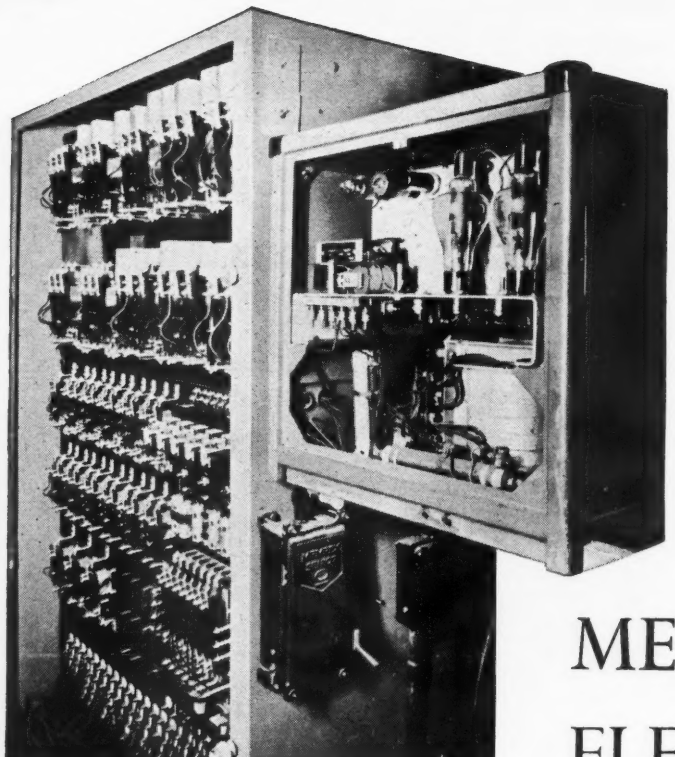

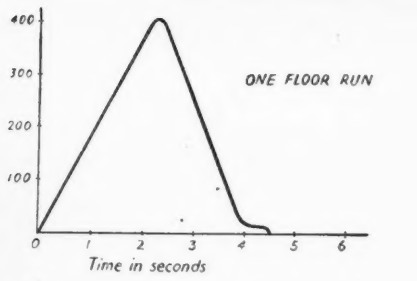

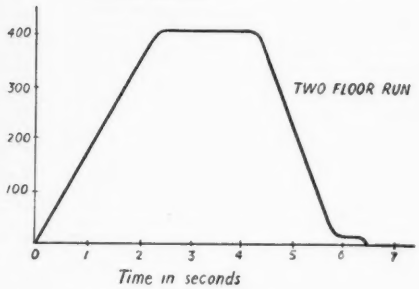

The main lift controller and electronic control equipment, which can be sited in any convenient position. Right · *Factual speed/time curves for this electronically controlled lift.* Below · *Drum mechanism, embodying cams and followers of the control gear, photographed across the lift shaft.*

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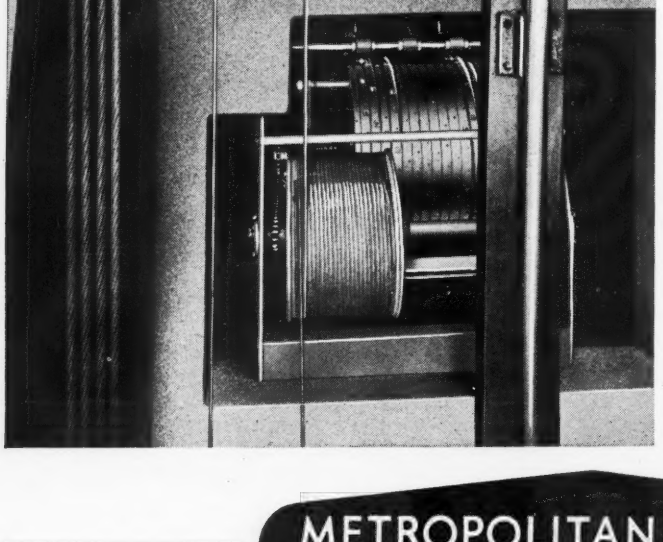
STEPLESS VARIABLE-VOLTAGE LIFT DRIVE



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(*Continued from page* 188)

directors are to be appointed by the subscribers. Solicitors: Howard Kennedy & Co., 23, Harcourt House, 10, Cavendish Square, W.1.

H. J. P. Bayliss & Son, Ltd.—Registered 10th June. Capital £100. Electrical, mechanical and electronic engineers, etc. Directors: H. J. P. Bayliss and P. J. Bayliss. Regd. office: 312, Long Lane, Finchley, N.2.

Airflow Developments, Ltd.—Registered 8th June. Capital £2,000. Manufacturers and repairers of and dealers in electrical instruments, plant, machinery, appliances, fittings and accessories, radio and television sets, etc. Directors: A. C. Wilson and Mrs. Nancy L. Wilson. Regd. office: 121, New Road, Booker, High Wycombe, Bucks.

Magneto Winding Co., Ltd.—Registered 9th June. Capital £1,000. Electronic coil winders and rewinding specialists, etc. Directors: P. O'Boyle and S. G. Mortimer. Regd. office: Creek House, Hope Street, Kingston-on-Thames.

Prototype Engineers, Ltd.—Registered 17th June. Capital £5,000. Machinists, manufacturers of and dealers in motor and aircraft components, radio, gramophone, television, telegraphic, telephonic, mechanical, sound producing and electrical goods and accessories, etc. The first directors are J. H. T. Wingham and K. E. Calcutt. Solicitors: Benning, Hoare & Drew, Dunstable.

Jack Barnett & Co., Ltd.—Registered 23rd June. Capital £500. Manufacturers and repairers of and dealers in dynamos, motors, armatures, magnetos, etc. Directors: J. Barnett, B. Barnett, Mrs. Edith Barnett, S. Coss and Mrs. Pearl Coss. Regd. office: 52, Corporation Street, Manchester, 4.

Brown Bros. (Electrical), Ltd.—Registered 23rd June. Capital £5,000. Manufacturers and distributors of, agents for and wholesale and retail dealers in electrical goods, radio and television sets, etc. Directors: H. G. Landey, Mrs. Shirley Landey, J. S. Landey and Mrs. Doreen Landey. Regd. office: 185, North Street, Leeds.

Electrical & Mechanical Testing Co., Ltd.—Registered 23rd June. Capital £100. Directors: G. A. Murray, W. A. Wales and J. H. Tregunno. Regd. office: 17, Northburgh Street, E.C.1.

H. R. Smith (Dunstable), Ltd.—Registered 23rd June. Capital £500. Manufacturers of and dealers in electrical goods of all kinds, radio and television sets, etc. Directors: H. R. Smith and Mrs. Constance W. Smith. Regd. office: 17, Church Street, Dunstable.

Philip Carnell, Ltd.—Registered 23rd June. Capital £1,000. Wholesalers and retailers of electrical, mechanical or atomic components of all kinds, including radio and television sets, radar, etc. Directors: P. L. Carnell and G. F. Carnell. Regd. office: 78, Old Broad Street, E.C.

New Estate Electrical, Ltd.—Registered 22nd June. Capital £1,000. Manufacturers of and dealers in electrical apparatus of all kinds, etc. Directors: J. Rivlin and Mrs. Sulamith Rivlin. Regd. office: Guildford Chambers, 109-113, The Headrow, Leeds, 1.

Deacons Electric, Ltd.—Registered 24th June. Captal £2,000. Electrical engineers and contractors, etc. Directors: D. J. Glenister and Mrs. Gertrude Glenister. Regd. office: 43, Old Shoreham Road, Portslade, Sussex.

Aloyd, Ltd.—Registered 27th June. Capital £700. Electrical and mechanical engineers and manufacturers, etc. Directors: J. Allan, Marjorie Allan and F. C. Lloyd. Regd. office: 68, Argyle Street, Birkenhead.

Spencer-West, Ltd. — Registered 24th June. Capital £10,000. To acquire the goodwill of the business of electronic engineers and instrument manufacturers carried on by S. S. West at Quay Works, Great Yarmouth, as Spencer-West. Directors: S. S. West and Mrs. Amelia West. Regd. office: Quay Works, North Quay, Great Yarmouth.

Britton Electronic Co., Ltd.—Registered 24th June. Capital £100. Directors: R. W. Britton and Mrs. Freda K. Britton. Regd. office: 242, Kingston Road, New Malden, Surrey.

Sansons H.F. Welded Products, Ltd.—Registered 21st June. Capital £1,000. Manufacturers of and dealers in high frequency welding machines and all apparatus and fittings used in connection with electric welding processes, electrical engineers and contractors, radio, mechanical and general engineers, etc. Directors: Pauline A. Sanson, J. E. Sanson, G. H. Sanson and Alma L. Williams. Regd. office: Forde House, 51, Cloth Fair, E.C.4.

Increases of Capital

Etchells, Congdon & Muir, Ltd.—Increased by £20,000 in 7,000 unclassified and 13,000 7½ per cent cumulative redeemable 3rd preference shares of £1, beyond the registered capital of £30,000.

Electric & General Investment Co., Ltd.—Increased by £298,500, in £1 ordinary shares, beyond the registered capital of £201,500.

Howells (Electric Motors), Ltd.—Increased by £39,000, in £1 ordinary shares, beyond the registered capital of £13,000.

Rashleigh Phipps & Co., Ltd.—Increased by £50,000, in £1 ordinary shares, beyond the registered capital of £50,000.

Robert Jenkins & Co., Ltd.—Increased by £250,000, in 119,256 redeemable preference and 130,744 ordinary shares of £1 beyond the registered capital of £250,000.

Zenith Electric Co., Ltd.—Increased by £50,000, in £1 ordinary shares, beyond the registered capital of £75,000.

Hotpoint Electric Appliance Co., Ltd.—Increased by £525,000, in £1 ordinary shares, beyond the registered capital of £250,000. The above increase is for the purpose of acquiring the undertaking of International Refrigerator Co., Ltd., and Premier Electric Heaters, Ltd.

Normand Electrical Co., Ltd.—Increased by £180,000, in £1 ordinary shares, beyond the registered capital of £20,000.

Liquidations

Dudley Electrical (Wholesale) Supplies, Ltd.—First and final dividend of 3s 11⅞d in the £, payable at Somerset House, 37, Temple Street, Birmingham, 2.

Empire Electric Co. (Hounslow), Ltd.—Liquidator, Mr. N. W. Osborne, 11-12, Finsbury Square, London, E.C.2, appointed 17th June.

Bankruptcies

H. Rose, 158 Soho Road, Handsworth, Birmingham, carrying on business under the style of Rose Electrical Service, electrical contractor and dealer.—Application for discharge to be heard on 19th September at the County Court, Newton Street, Birmingham.

A. H. Banwell, 4, Dominion Road, Fishponds, Bristol, electrical radio retailer.—Trustee, Mr. P. W. Hort, 28, Baldwin Street, Bristol, released 20th June.

W. R. Eagle, lately carrying on business at 10, Houghton Chambers, 1, Houghton Place, and residing at 70, Eaton Gardens, both in Liverpool, electrical contractor.—Supplementary dividend of 1s 6d in the £, payable at the office of the Trustee, Mr. E. S. Browne, 41, North John Street, Liverpool, 2.

W. H. T. Mason, Castle Street, Mere, Wilts, trading as W. H. Mason & Son, electrical engineer.—First and final dividend of 2s 8d in the £, payable on and after 25th July at 34, Fisherton Street, Salisbury.

S. R. Nightingale, 149, Elm Bank Terrace, South Street, Andover, Hants, electrical engineer and poultry farmer, lately carrying on business at St. Withins, Waltham Chase, Southampton.—Receiving order made 6th July on debtor's own petition.

L. C. Shearley, electrical engineer, 392, New Cross Road, London, S.E.14, lately carrying on business at Manor Barn, Aldingbourne, Chichester.—First meeting 28th July and public examination 23rd August, both at Bankruptcy Buildings, Carey Street, London, W.C.2.

F. W. J. Meyer.—4, Dunsany Road, West Kensington, London, W.14, electrician.—Public examination 6th September at Bankruptcy Buildings, Carey Street, London, W.C.2.

NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (3s 0d each including postage) will be obtainable after 24th August from the Patent Office, 25, Southampton Buildings, London, W.C.2.

1949

3972. Standard Telephones & Cables, Ltd. —Register translators for telecommunication switching systems. 10th February, 1950. (735501.)

1950

6594. Concordia Electric Safety Lamp Co., Ltd., and Steadman, C. H.—Means for operating electrical discharge tubes or lamps in which two or more tubes or lamps are connected in series. 16th March, 1951. (735421.)

11385. British Thomson-Houston Co., Ltd.—Crystal valves. 22nd June, 1951. (735691.)

28850. Marconi's Wireless Telegraph Co., Ltd.—Television and like camera pick-up tube arrangements. 3rd August, 1951. (735562.)

31525. British Telecommunications Research, Ltd.—Variable impedance devices. 17th December, 1951. (735506.)

1951

1713. Standard Telephones & Cables, Ltd.—Electric pulse distributing apparatus. 23rd January, 1951. (735508.)

3644. Electric & Musical Industries, Ltd. —Cathode-ray tubes and arrangements therefor. 24th January, 1952. (735632.)

7323. General Electric Co., Ltd., Davies, B. L., Dudding, R. W., and Woolman, M. K. —Manufacture of luminescent screens. 28th March, 1952. (735633.)

8490. United Kingdom Atomic Energy Authority.—Fluid contactor apparatus. 7th April, 1952. (735422.)

10488. Atkins, B. R., Lanham, M. J., and Maer, P. S.—Commutators for dynamo-electric machines. 28th April, 1952. (735509.)

11756. British Resin Products, Ltd.—Insulation of electrical equipment. 5th May, 1952. (735510.)

13642. Beer, D. C.—Snap-action electric switches. 8th September, 1952. (735569.)

17270. South Wales Switchgear, Ltd., and Buttrey, R. N.—Electrical circuit-breakers, transformers and like apparatus. 9th May, 1952. (735425.)

28810. Electric & Musical Industries, Ltd. —Television cameras. 3rd December, 1952. (735700.)

29313. Automatic Telephone & Electric Co., Ltd.—Telephone systems. 10th November, 1952. (735635.)

1952

1656. Dynaport Radio & Television, Ltd., and Hofmeister, I.—Cathode-ray tube apparatus. 21st April, 1953. (735512.)

4240. British Thomson-Houston Co., Ltd. —Amplifiers. 16th February, 1953. (735427.)

4904. Sylvania Electric Products, Inc.—Mercury dispenser. 25th February, 1952. (735638.)

11501. Standard Telephones & Cables, Ltd.—Electrical counting circuits. 10th February, 1950. (735515.)

11735. Westrup, E.—Illuminated display devices. 7th May, 1953. (735516.)

12863. British Thomson-Houston Co., Ltd.—Electric control circuits. 19th May, 1953. (735518.)

16985. Standard Telephones & Cables, Ltd.—Electrical circuits. 7th July, 1952. (735522.)

17554. British Thomson-Houston Co., Ltd. —Apparatus for feeding powdered material. 30th June, 1953. (735436.)

17991. Pye, Ltd.—Television apparatus incorporating pick-up tubes. 15th July, 1953. (735523.)

18859. Philips Electrical Industries, Ltd.— Receivers for reproducing coloured or stereoscopic television images. 25th July, 1952. (735524.)

18860. Philips Electrical Industries, Ltd. —Colour television and stereoscopic television cameras. 25th July, 1952. (735525.)

21338. Joyce, A. A.—Electric battery filling devices. 24th November, 1953. Cognate application 6863, 12th March, 1953. (735441.)

21670. General Electric Co., Ltd., and Wilson, E.—Electrical apparatus. 26th August, 1953. (735442.)

24847. Standard Telephones & Cables, Ltd.—Electrical condenser. 3rd October, 1952. (735450.)

26620. General Electric Co.—Electrical insulation. 23rd October, 1952. (735532.)

26954. General Electric Co., Ltd., and Pickering, I. J.—Dashpots. 16th October, 1953. (735457.)

27689. Electric & Musical Industries, Ltd. —Manufacture of cathode-ray tubes. 2nd October, 1953. (735716.)

27867. Murphy Radio, Ltd.—Line scanning circuits for television receivers. 5th November, 1953. (735650.)

28124. General Electric Co., Ltd.—Electric discharge devices. 6th November, 1953. (735463.)

28536. Shrubsall, G. W. G.—Electric accumulators. 11th February, 1954. (735651.)

31276. International Business Machines Corporation.—Electrically operated data reproducing and recording system. 10th December, 1952. (735586.)

31713. English Electric Co., Ltd.—Axle-hung electric traction motor drives. 11th December, 1953. (735587.)

1953

407. Taylor, A. J.—Manufacture of electrical components. 31st December, 1953. (735726.)

510. Philips Electrical Industries, Ltd.— Cathode-ray tubes. 7th January, 1953. (735470.)

2591. General Electric Co.—Refrigerating apparatus. 29th January, 1953. (735473.)

4600. Evershed & Vignoles, Ltd.—Electric motor control. 28th January, 1954. (735536.)

5468. Reyrolle & Co., Ltd., A.—Welding generators. 25th May, 1954. Addition to 692155. (735537.)

6998. Radio-Industrie.—Television equipment. 13th March, 1953. (735592.)

8708. General Electric Co.—Silicone rubbers. 30th March, 1953. (735736.)

8904. Zenith Radio Corporation.—Coding arrangement for a television transmitter or receiver. 31st March, 1953. (735541.)

9880. Glas-Col Apparatus Co., Inc.— Electric warming device for liquids. 10th April, 1953. (735674.)

10515. Revo Electric Co., Ltd.—Means of mounting an electric socket connector on an electric cooker. 12th April, 1954. (735737.)

10516. Revo Electric Co., Ltd.—Fuse carriers for electric cartridge fuses. 12th April, 1954. (735738.)

14363. Wickman, Ltd.—Current regulating systems for electric arc welding plant. 14th May, 1954. (735544.)

19418. Chase-Shawmut Co.—Thermal protector for electric conductor insulation. 13th July, 1953. (735601.)

20620. Siemens-Schuckertwerke Akt.-Ges. —Automatic electric switches with overload release. 24th July, 1953. (735603.)

21522. Mechanical Products, Inc.—Electric circuit-breakers. 4th August, 1953. (735549.)

23486. Telefonaktiebolaget L. M. Ericsson. — Multi-channel telecommunication systems. 25th August, 1953. (735496.)

27695. Skylux, Ltd.—Machines for use in boring underground and for positioning underground service pipes, conduits, cables and the like. 8th October, 1953. (735552.)

29300. Standard Telephones & Cables, Ltd.—Electrical counting circuits. 7th May, 1952. (735553.)

31527. Philips Electrical Industries, Ltd. —Frequency stabilizing circuit arrangements. 13th November, 1953. Addition to 679457. (735554.)

31747. Automatic Electric Laboratories, Inc.—Impulse senders. 16th November, 1953. (735620.)

32225. Texaco Development Corporation. Electric analogues. 20th November, 1953. Addition to 693782. (735623.)

33530. Radio Corporation of America.— Colour correction systems. 2nd December, 1953. (735627.)

34990. Allmanna Svenska Elektriska Aktiebolaget.—Electric circuit-breakers utilizing an arc-extinguishing medium. 16th December, 1953. (735555.)

1954

5439. Olin Industries, Inc.—Apparatus for the electrochemical transformation of gaseous material by treatment with electrical glow discharges. 29th December, 1952. (735688.)

9012/3. Automatic Telephone & Electric Co., Ltd.—Telephone systems. 10th November, 1952. (735689/90.)

TRADE MARKS

APPLICATIONS have been made for the registration of the following trade marks. Objections may be entered up to 29th July:—

PNEUTRONIC. No. 735,438, Class 9. Electrical apparatus for measuring variable quantities, for indicating and recording such measurements and for controlling the operation of other apparatus in order to take account of the variations.—Fielden Electronics, Ltd., Paston Road, Wythenshawe, Manchester.

RONETTE-FONOFLUID. No. 736,098, Class 9. Apparatus for converting mechanical vibrations into electrical vibrations; apparatus for converting electrical vibrations into mechanical vibrations; electric cables, transformers, connections, microphones and stands, etc.— "Ronette" Piezo - Electrische Industrie (Ronette p.e.i.) N.V., Amsterdam, The Netherlands. Address for service, c/o F. J. Cleveland & Co., 29, Southampton Buildings, Chancery Lane, London, W.C.2.

No. 740,091 (design), Class 9. Electrical apparatus for soldering, brazing and welding; electrodes for arc welding apparatus and electric soldering irons, and parts.—H. J. Enthoven & Sons, Ltd., Enthoven House, 89, Upper Thames Street, London, E.C.4.

ROFTON. No. 740,921, Class 9. Radio receiving apparatus, television receiving apparatus, radiograms, sound amplifiers, and parts.—Quality Equipment Designers, Ltd., 101, Hatton Garden, London, E.C.1.

ZODIAN. No. 741,136, Class 9. Electrodes for electric arc welding.—Quasi-Arc Co., Ltd., Bridgewater House, Cleveland Row, St. James's, London, S.W.1.

CRYSLUX. No. 740,930, Class 11. Electric lighting fittings.—Jerron Electric, Ltd., 34-38, Osborne Road, Acton, London, W.3.

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

CONTRACTS OPEN

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses

Aberdeen.—13th August. Harbour Commissioners. Electrical fittings for harbour works maintenance for one year from 1st October. Harbour engineer, 15, Regent Quay.

Australia.—12th August. Brisbane City Council Electricity Department. Circulating water screens for Tennyson power station. (E.S.B. 14681/55. Ten/14558.)* 26th August. Sixty 33 kV lightning arrestors. (E.S.B. 14682/55. Ten/14550.)*

18th August. State Electricity Commission. Switchgear for a 22 kV system. (E.S.B. 14478/55. Ten/14525.)*

6th August. Posts and Telegraphs, G.P.O., Melbourne. V.h.f. radio telephone systems. (E.S.B. 14949/55. Ten/14643.)*

4th October. Public Works Department, Western Australia. Two centrifugal pumping units, electric motors, etc., for Narrojin. (E.S.B. 14880/55. Ten/14633.)*

Belfast.—9th September. City Corporation Electricity Department. 33 kV switchgear equipments and five 33/6·6 kV, 12,500 kVA outdoor stepdown transformers. (See this issue.)

Belgium.—27th July. Telegraph and Telephone Administration, Brussels. Insulated wire and cable. (E.S.B. 14261/55. Ten/14528.)*

Bodmin.—13th August. Borough Council. Street lighting equipment. (See this issue.)

Chepstow.—13th August. U.D.C. Street lighting equipment. (See this issue.)

Consett (Durham).—U.D.C. Electrical installation in central depot at Villa Real. Surveyor, Council Offices, Medomsley Road.

Durham.—County Council. Electrical installations in Winlaton C.E. Controlled, Dinsdale Park Residential and Hookergate Grammar Schools. County architect, Court Lane.

Formosa.—10th August. Central Trust of China, U.S. Aid Division, Taipei. Disconnecting switches, metalclad switchgear, power and oil circuit-breakers, etc. (E.S.B. 14705/55. Ten/14585.)* 12th August. Electrical equipment including auxiliary and differential relays, auto-transformers, etc. (E.S.B. 14702/55. Ten/14607.)* 29th August. 3,000 kVA substation, distribution transformers, etc. (E.S.B. 14866/55. Ten/14640.)*

Halifax.—13th August. Town Council. Two identical fully automatic electrically driven centrifugal pumps. Waterworks engineer, Gibbet Street.

India.—30th July. Government of Mysore, Stores Purchase Committee. A.c.s.r. conductors. (E.S.B. 14276/55. Ten/14573.)*

1st August. Government of India, Stores Purchase Committee. Fuse cut-outs for 5 and 15 kV. (E.S.B. 14233/55. Ten/14572.)*

23rd August. Government of Andhra. Transformers for the Machkund hydro-electric scheme (second stage). (E.S.B. 14304/55. Ten/14521.)*

1st September. Bombay Electricity Supply and Transport Undertaking. 22 kV and 6·6 kV switchgear. (E.S.B. 14678/55. Ten/14568.)*

Iraq.—10th August. Directorate General of Municipalities, Baghdad. Two 250 kVA and five 50 kVA transformers and switchgear for Haditha. (E.S.B. 14792/55. Ten/14619.)* 15th September. 150 kW and 75 kW diesel-driven alternators, switchgear, etc., for Dehuk. (E.S.B. 14791/55. Ten/14623.)* 24th September. Three 500 kW and 250 kW alternator sets, switchgear and two 1,000 kVA transformers for Diwaniya. (E.S.B. 14789/55. Ten/14605.)*

Pakistan.—6th August. Posts and Telegraphs Department. Insulators, wires and wiring material. (E.S.B. 14712/55. Ten/14566.)*

20th September. Department of Supply and Development. Boiler plant, steam turbo-alternators, gas turbine generating sets, dual-fuel pumping sets, etc. (E.S.B. 14239/55. Ten/14527.)*

Penge.—20th August. U.D.C. Street lighting equipment. (See this issue.)

Philippines.—3rd August. National Power Corporation, Manila. Transformers, switchgear, etc., for Baguio City and Mines Terminal substations. (E.S.B. 14000/55. Ten/14576.)*

11th August. Council for U.S. Aid, Manila. 220 V remelting furnace and one electrotype furnace. (E.S.B. 14737/55. Ten/14614.)*

Poole.—29th July. Town Council. Electrical installation in Longfleet Primary School. J. R. Barron, borough surveyor, Municipal Buildings.

Rochdale.—29th July. Town Council. Electrical installation in Derby Street Primary School. Borough surveyor, Town Hall.

Sheffield.—2nd August. City Council. Electrical installations at Chaucer Secondary Modern School. J. L. Womersley, city architect, Town Hall, 1.

South Africa.—4th August. Union Tender and Supplies Board. Armoured cable. (E.S.B. 14658/55. Ten/14543.)* Detectors. (E.S.B. 14875/55. Ten/14650.)* 12th August. Cable. (E.S.B. 14997/55. Ten/14646.)* 18th August. Twenty mobile radio equipments, etc., for the South African Police. (E.S.B. 14815/55. Ten/14596.)*

5th August. City of Durban Corporation. Telephone cordage. (E.S.B. 14630/55. Ten/14553.)*

10th August. Stores Department, South African Railways. Relays and current transformers. (E.S.B. 14657/55. Ten/14552.)*

Stafford.—6th August. Borough Council. Street lighting equipment. (See this issue.)

Stoke-on-Trent.—28th July. Corporation. Supply of electric lamps for six months ending 31st March, 1956. City surveyor, Town Hall.

* Specifications may be inspected at the Export Services Branch, Board of Trade, Lacon House, Theobald's Road, London, W.C.1 (Chancery 4411; extension 769).

ORDERS PLACED

Cork.—County Council. Recommended. Electrical installation, Central Hospital, Bantry (£27,595).—P. Lynch.

Darlington.—Corporation. Electric rewiring of Reid Street Schools, Darlington (£1,909) (new tender).—J. Paterson and Co.

Heston and Isleworth.—Works, Baths and Fire Brigade Committee. Recommended. Improvement of lighting in part of Bath Road (£4,339).—Harland & Wolff.

Ipswich.—Paving and Lighting Committee. Recommended. Improved lighting in various streets (£3,396).—G.E.C.

Newbury.—Housing Committee. Recommended. Installation of electricity in houses on various pre-war estates:—R. J. Hewett (Newbury) (£2,097 for 108 houses); Home Electrics (£226 for 12 houses); and P. A. Baker (£787 for 34 houses).

Newcastle-on-Tyne. — Regional Hospital Board. Electrical installation in new villa at Prudhoe and Monkton Mental Hospital (£1,129).—F. Reid, Ferens and Co.

Newcastle-under-Lyme.—Borough Council. Sodium lighting on Clayton Road (£7,000). —Cohen Bros. (Electrical).

Nuneaton.—Education Committee. Electrical installation in Alderman Smith School (£10,414).—Whitcomb & Blackwell.

Peterborough.—County Council. Electrical installations in County Grammar School for Girls (£4,239).—Grenfells.

Washington (Durham).—U.D.C. Electrical installations in four shops and flats (£140), and in 62 new houses (£1,357).—F. E. White.

Wellington (Salop).—U.D.C. Electrical installations in 64 council houses.—E. W. Jones (Electrical).

WORK IN PROSPECT

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Altrincham. — Crematorium; Altrincham, Bowdon, Hale and District Cemetery Board, Dunham Road.

Ashington.—Cinema, Lintonville Terrace, for the Essoldo Circuit, Ltd.; William Stockdale, architect, 73, Howard Street, North Shields.

Aveley.—Houses (66); A. Davis Construction Co., Ltd., 311, Hertford Road, London, N.9.

Barking.—Section of scheme for new municipal offices and town hall (£51,486); E. R. Farr, town clerk, Town Hall.

Bilston.—Large factory; Cannon Industries, Ltd., Deepfields.

Birmingham.—Flatted factories in Dartmouth Street (£403,161), and in Holloway Head (£236,130), and swimming baths in Station Road, Stechford (£491,800); A. G. Sheppard Fidler, city architect, Civic Centre, 1.

Bourne End.—Woodworking factory on site near The Limes; W. H. Deane (High Wycombe), Ltd., hospital furnishers, Wooburn Green.

Bradford.—St. Francis' Catholic Primary School, Meyers Lane; J. H. Langtry-Langton, architect, 8, Oak Mount Road.

Bristol.—11-storey block of 108 flats, Frogmore Street; city architect.

Chingford.—Library (£20,000), Green Farm estate; Essex County architect, County Hall, Chelmsford.

Colburn.—Primary school, North Riding E.C.; S. Morrison & Partners, Alkmunde House, 103, Belper Road, Derby.

Congleton.—Houses (80), on the Buglawton estate; H. S. Halpin, borough surveyor, Town Hall.

Consett.—Houses (40), at Moorside; E. Simpkin, U.D.C. surveyor.

Croydon.—Works extensions; Walterisation, Ltd., Waddon Marsh Way.

Cullercoats (Northumberland).—Additions to the Dove Marine Laboratory; W. B. Edwards and Partners, architects, 52, Eldon Place, Newcastle-on-Tyne.

Dagenham.—Factory on the Hainault estate; V. W. Eves & Co., Ltd., 9, Railway Approach, London Bridge, London, S.E.1.

Depot and office block in Wantz Road; Situsec, Ltd., asphalts, River Road, Barking.

Doncaster.—Transport Department canteen in Factory Lane and pig market (£50,000) on Donkin Hill site; borough architect.

Enfield Wash.—Methodist church, Ordnance Road; Geo. Baines & Syborn, architects, 121, Victoria Street, London, S.W.1.

Fakenham.—Police station, houses and magistrates' court building; county architect, 27, Thorpe Road, Norwich.

Folkestone.—Conversion of chapel at Hawkinge Cemetery to Crematorium; borough surveyor.

Glasgow.—Buildings for Stow College of Building and Stow College of Distributive Trades; Wylie, Shanks & Wylie, architects, 12, Claremont Gardens.

Special school on site at Garthamlock, and primary schools at Drumchapel and Ruchazie; education architect, Bath Street Offices.

Gosforth.—Anglican church, Brunton Park (£23,000); A. R. Robertson & Son, Park View, Blyth.

Great Ayton (Yorks).—Additions to the Friends School (£30,000); F. Shepherd and Son, contractors, York.

Hampshire.—County secondary mixed school at Whitehill, Bordon, and county junior schools at Havant and Fareham; county architect, The Castle, Winchester.

Hemel Hempstead.—Bank at Bank Close, for Lloyds Bank, Ltd.; Trehearne & Norman Preston & Partners, architects, 83, Kingsway, London, W.C.2.

Holywood.—Dwellings (160); Northern Ireland Housing Trust, 12, Hope Street, Belfast.

Kilmarnock.—Works extensions; The Saxone Shoe Co., Ltd., Titchfield Street.

Leamington Spa.—Factory, trading estate; Filton, Ltd., The Wharf, Clapham Street.

Letchworth.—Houses (1,500), for L.C.C.; architects' department, County Hall, Westminster Bridge, London, S.E.1.

Lewisham.—Out-patients' unit at Lewisham Hospital, High Street, S.E.13 (£10,000 for electrical engineering works); secretary, South East Metropolitan Regional Hospital Board, 11, Portland Place, London, W.1.

London.—Flats (40), Breakspear Road, Deptford; borough engineer.

Research laboratories, Garrick Road, Hendon; Schweppes, Ltd., Connaught Place, W.2.

Hostel, Holland Park, Kensington; Geo. Fairweather, architect, 28, Wigmore Street, W.1.

Apprentices' training school, Willesden; Rotax, Ltd., Chandos Road, N.W.10.

Flats (48), in two blocks, proposed on the Winstanley Road site, Battersea (£101,000); borough engineer, Town Hall, Lavender Hill, S.W.11.

Proposed central library in Camden High Street; town clerk, St. Pancras Town Hall, Euston Road, N.W.1.

Loughborough.—Second swimming bath proposed (£120,000); borough architect, Loughborough, Leics.

Manchester.—Warehouse and office block; Samuel Gratrix, Ltd., Quay Street.

Factory and warehouse in Camp Street, 3; G. & A. Heighway, Ltd., house furnishers, 105, Deansgate, 3.

Middlesbrough.—Accident wing Middlesbrough General Hospital for Newcastle Hospital Board (£350,000); P. H. Knighton, chief architect, Benfield Road, Newcastle-on-Tyne.

Four primary schools, two secondary schools and a college (£650,000); borough architect.

Newcastle-on-Tyne.—Further additions to the Percy Hedley School for Spastics (£75,000); C. C. Brown, honorary architect, County Hall, Newcastle-on-Tyne.

Offices, Hood Street, for the Grainger Building Society; L. J. Couves and Partners, architects, Carliol House.

Five-storey additions to the chemistry laboratory and new arts buildings for King's College; Edwards and Partners, architects, 52, Eldon Place.

Newport (Mon).—Paper mill, Sudbrook; Wiggins Teape & Alex. Pirie, Ltd., Mansell Street, London, E.1.

Peterborough.—Warehouse and offices in St. Martin's Street; S. A. Rolfe & Son, Ltd., wholesale confectioners, 417, Lincoln Road.

Shops, office, warehouse and showroom, Cumbergate and Queen Street; Amies & Son, ironmongers, Long Causeway.

Improvements to Woodston C. of E. School, including replacement of gas by electricity; county architect, Bridge Street, Peterborough.

Romford.—Factory, Harold Hill estate; The Benton Engineering Co., Ltd., Myrtle Road, Ley Street, Ilford.

South Shields.—Additions to transport depot; J. Reid, borough engineer.

Stamford.—Laundry for Stamford and Rutland Hospital; Ernest G. Phillips, Son & Norfolk, consulting engineers, 26, Annesley Grove, Nottingham.

Sunderland.—Service garage at Fulwell for the T.C. (£60,000); H. C. Bishop, borough architect.

Swansea.—Mineral water works, Tirpenry Street, Morriston; Co-operative Wholesale Society, Ltd., St. Mary Street, Cardiff.

Tynemouth.—Factory, Bird Street, for T. B. Bilton and Sons, engineers, Bell Street, North Shields.

Wallsend.—Old people's houses (36); G. N. Teasdale, borough engineer.

Infants' schools in North Terrace and Denbigh Avenue for Northumberland C.C.; county architect, County Hall, Newcastle-on-Tyne.

Factory building in Stephenson Street for Tyne Timber and Veneers, Ltd.; W. H. Armfield and Co., contractors, Mitcham, Surrey.

Four-storey flats for the T.C.; J. W. Hanson and Son, architects, 123, Northumberland Street, Newcastle-on-Tyne.

Watford.—Office block, King Street; The Bury Building Co., Ltd., Canonbridge House, Bury Street, Ruislip.

Houses (50) at Garston; F. C. Sage, borough surveyor, Town Hall.

Willenhall.—Houses (134), on New Invention No. 2 site, for U.D.C.; E. E. Bannington, architect, Town Hall.

Wolverhampton.—Branch library, Oxley; borough engineer.

Wroughton.—Houses (101), Perry's Lane; Edwin H. Bradley & Sons, Ltd., Okus Quarry, Swindon.

Yeovil.—Secondary modern school, Buckler's Mead, for Somerset E.C.; Musman and Cousens, architects to Council, 12, Upper Berkeley Street, London, W.1.

Geo-Thermal Steam Developments

There have been considerable developments in obtaining and using geo-thermal steam in New Zealand during comparatively recent months, and it has been found that hot steam exists at tremendous pressures under the crust of earth in a large area of the volcanic belt of the North Island; indeed the steam manifests itself in numerous steam vents and semi-active volcanoes throughout a much larger area than was originally thought. Steps are being taken to utilize this power for the production of electricity outside the source already tapped at Wairakei, and associated with it is, of course, the scheme to produce heavy water which can be made as a by-product of geo-thermal steam. The cost of the scheme, estimated at £6 million, is to be contributed jointly by the New Zealand Government, which will pay for the construction of the electric power plant, and the British Government, which will provide roughly a third of the cost of the heavy water plant. A company, the Geo-Thermal Development, Ltd., has been formed to carry out the development, and it is comprised of New Zealanders and members of the United Kingdom Atomic Energy Authority.

The Wairakei area, which is just north of Lake Taupo, has a close concentration of active geysers and other evidences of latent steam power below the surface, which at once became proof positive of the potential when the first shaft was sunk near the Government tourist hotel. White clouds of steam were ejected and there was a resultant white rain of silica.

Over thirty bores have been so far drilled in the area to depths ranging from five hundred to over three thousand feet. Pressures at the head vary between 100 lb/sq in and 130 lb/sq in, and drills of up to eight inches diameter are used. Construction of a 40 MW electricity generating plant is now proceeding and tenders have been called for the steam turbo-alternators.

Superheated steam and electric power of course have a clear meaning to the atomic scientist—heavy water, which costly liquid can play an important part in the production of atomic energy.

Twin geo-thermal bores and steam jets in the Wairakei area

Television in Australia

Australia's first national television transmitters in Sydney and Melbourne will be built by Amalgamated Wireless of Australasia. The total cost is estimated at £A372,000. The Government has stipulated that deliveries are to be made within the next twelve months. Installation may take six months. Marconi's Wireless Telegraph Co. is expected to supply a large part of the transmitters. Tenders for the equipment necessary for the national television studios are now being studied.

The Australian Government has rejected proposals for outright commercial television or for monopoly control by a national authority. Instead it has allocated a limited number of television licences to commercial interests and others to the Australian Broadcasting Commission.